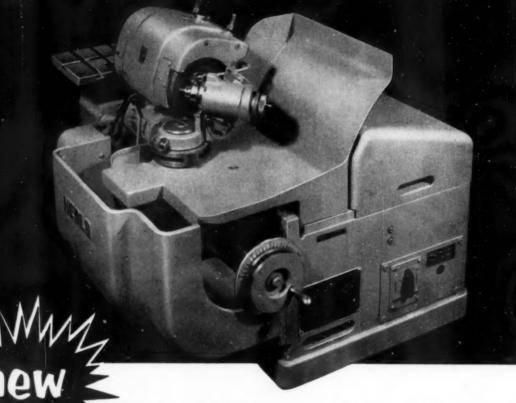
# THE TOOL ENGINEER

MAY 1956

abrasive belt machining

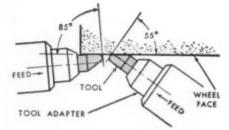
PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

with MACHINE PRECISION



HEALD MODEL 3 TOOL SHARPENER

saves time, gives longer tool life, permits faster, more efficient borizing



The oscillating tool holder swings through an arc of up to  $150^\circ$ , to grind a maximum side angle of 85° on one side of the tool and  $55^\circ$  on the other side. Front clearance angles are adjustable from  $-10^\circ$  to  $+30^\circ$  and tool radius can be set anywhere from 0 to 1%''. Precision calibrated scales eliminate guesswork and the mechanical machine cycle avoids any possibility of human errors or inaccuracies in the grinding operation.

LET's face it. Off-hand grinding just isn't precise enough for modern, high-speed borizing tools. To obtain maximum borizing efficiency, tools must be of the precisely correct shape—in complete conformity with design specifications.

With the new Model 3 Tool Sharpener, this requirement is met—and easily. Just dial the desired tool shape on the calibrated scales, clamp the tool in the holder and press the start button. Tool holder oscillation and wheel reciprocation are mechanically controlled, grinding up to five different angles and the radius with only an occasional hand adjustment for feeding the tool against the wheel. Precision is far greater than obtainable by off-hand grinding. What's more, any desired tool shape can be exactly duplicated again and again.

The mechanical precision built into this improved Model 3 machine assures a sharp, flawless cutting edge that will produce more and better work per sharpening. For complete details, send for Bulletin 2-4-2. It Pays to Come to Heald!

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COVER: The improved coated abrasive belt has sired a whole new family of machine tools that are doing jobs formerly handled by standard tools. Classification of these tools is described in an article beginning on page 88.



# The Tool Engineer

Volume XXXVI, No. 5

May 1956

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THE TOOL ENGINEER is regularly indexed in the Engineering Index Service and the Industrial Arts Index

PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION



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### The Tool Engineer

### **Preventing Corporate Amnesia**

Planning for continuity of production in event of an enemy attack is one of the most important tasks facing industry today. Even though everyone prays that no attack will come, ability to recoil from a devastating blow is essential. This lessens the attractiveness of an attack and, if one should come, provides the elements of survival.

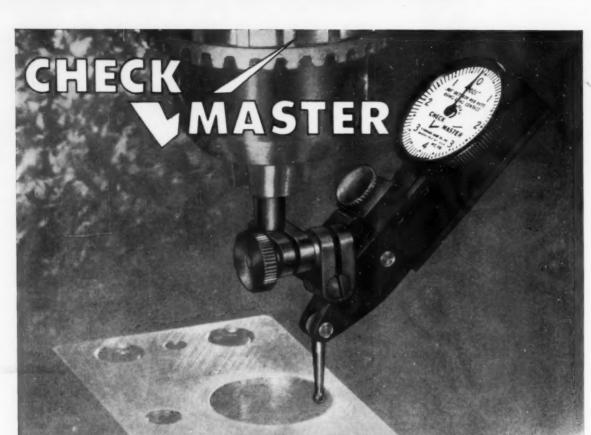
Objective is to lessen the disruption caused by corporate amnesiathe condition when facilities, personnel and records may be unable to function effectively. Many companies are developing plans for use in an emergency. These are designed to fill the void-in both management and facilities-and lessen the consequences of being "sitting ducks." Management should have a rendezvous point and information should be available so that production could be carried on at another plant.

The Office of Defense Mobilization helps in formulating plans and acts as a clearing house. It believes that individual industry plans, formulated and executed by industry, are far superior to any master plan that could ever be conceived at Washington. Basis of the program is to have industry develop a "do-it-yourself" system.

Given the challenge and an awareness of the need, industry can be depended upon for a workable solution. This may include underground plants, tooling in other locations, microfilms and information in time capsules. In event of damage, Government can use aerial reconnaissance, evaluate damage and utilize computers in making decisions.

With teamwork, the period of amnesia would be shortened, enabling us to recoil and strike back. That country which can recoil fastest will survive. Make sure that country is ours!

John W Greve



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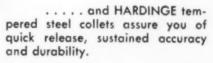
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- Grips both <u>short</u> and long lengths properly.

Write for Bulletin 8—
complete information on



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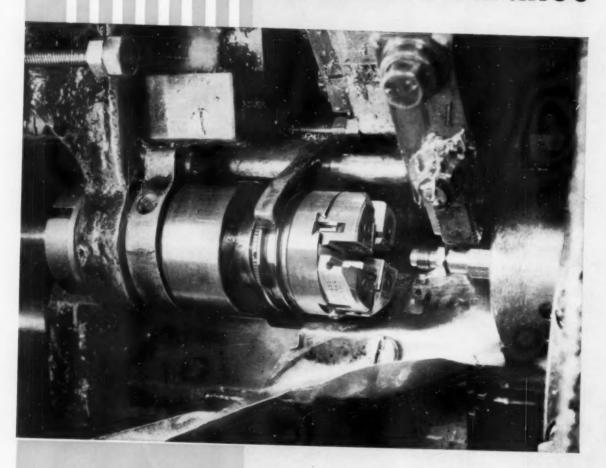
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# Economy Limited Clearance



# Threading On Automatics....



To assure economy threading on automatic screw machines where limited die head clearance is a major factor Frank H. Wilson Co., Inc. in Detroit, Michigan use the ½" LL LANDEX Head. Applied to one of their small Acme-Gridley's for threading tubing nuts this head cuts ½", 20 pitch UN threads ¾" in length on B1113 screw stock to a class three fit. An average of 20,000 pieces are threaded between chaser grinds.

Compactly designed with only a  $2\frac{7}{16}$ " swing the  $\frac{1}{2}$ " LANDEX will thread all diameters from #4 to  $\frac{1}{2}$ ". A minimum number of working parts made of hardened and ground alloy steel, chaser holders designed to eliminate warpage and springing, and the use of precision LANDIS Tangent Chasers - - - all contribute to the high degree of rigidity and accuracy of this LANDEX Head.

Compare the chaser lengths in the illustrations and note the long life this LANDIS User has received from the chasers used in this application. These chasers will still produce thousands of threads as (1) LANDIS Tangential Chasers are usable for 80% of their original length; (2) only a few thousandths of metal need be removed from a chaser when regrinding; (3) when regrinding the same amount of metal need not be removed from each chaser; (4) long chaser life is received between grinds. These are the basis for economy in any threading operation.

For further information on this LANDEX Head and on other LANDIS Heads using Tangential Chasers and designed for all types of thread-cutting operations write for Bulletins F-80 and F-90. Please send specifications when writing.

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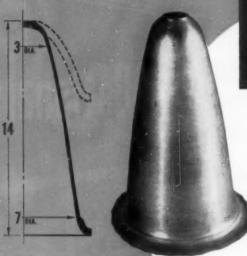
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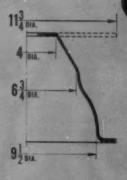
### HEMISPHERES TO 38" DIAMETER.

with 36" max, wall thickness, are readily formed on the Cincinnati Hydrospin, Part wall can be tapered or have constant thickness. The starting blank is a flat disk or dished preform. Almost any ductile metal can be used. Other machines available for parts and hemispheres larger than 38".



### PARABOLIC-SHAPED PART

formed in one pass in two minutes. Starting blank of 61 SO aluminum, 11 3/4" dia. x 1/6" thick, was preformed on a Cincinnati Hydroform.



#### COMPOUND CONTOURS

of this part were formed in one pass in one minute. Material is mild steel.

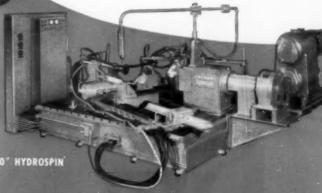
CINCINNATI 42" x 50" HYDROSPIN



# complicated contours cost <u>less</u> by Hydrospinning!

The parts shown here were formed by tracer Hydrospinning at substantial reduction in cost over that of previous production methods. These parts were produced in far less time . . . are more accurate ... have increased strength with greater resistance to fatigue failure . . . required less material . . . and were made without compromising on material requirements.

If difficult-to-form contoured components are one of your production headaches, get the facts on Hydrospinning. Call in a Cincinnati Milling field engineer. For a detailed description of the process and machine specifications, write for new Bulletin M-1873-2.





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PROCESS MACHINERY DIVISION

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American gives instant relief with fast service that assures you of the right drill bushing when you want it!

And... American produces the finest precision drill jig bushings containing extra features such as:

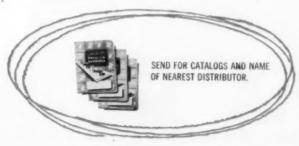
Double ground lead for easy pressing into the jig • Radius into the hole—to prevent tool hang-up, wear and breakage • Two way undercut under the head to insure squareness to the jig • 100% concentricity inspection • Internal ground holes to insure straightness • Original 3-D ordering method eliminating confusing code numbers • Patented bushings for plastic tooling • Complete local stocks.

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# What do you AMERICAN Think?

This standard 32-speed "AMERICAN" Hole Wizard Radial Drill head, in combination with a special drilling machine, has just completed the machining of 175,000 work pieces. The operations consisted of 6" diameter spot facing, drilling 5 holes ranging from 1.45" to 5" in diameter, step boring 3 holes ranging from 2.25" to 5" in diameter, two recessing operations and tapping 2.25" diameter holes.

In completing this job the tapping attachment frictions were engaged and disengaged well in excess of 1,000,000 times.

This entire operation was completed without one minute's down time and without maintenance or repair.

Although we have no data to substantiate this, we believe this <u>must</u> be some sort of a performance record.

think? ...

This is exactly the same type of head you get when you install a 32-speed "AMERICAN" Hole Wizard. What better guarantee of service could one ask than this performance record? This is the kind of service that has built "AMERICAN" prestige and preference and accounts for its worldwide reputation for top quality.

The many reasons contributing to "AMERICAN" Hole Wizard predominance are clearly illustrated and described by bulletin No. 327. May we send you one?

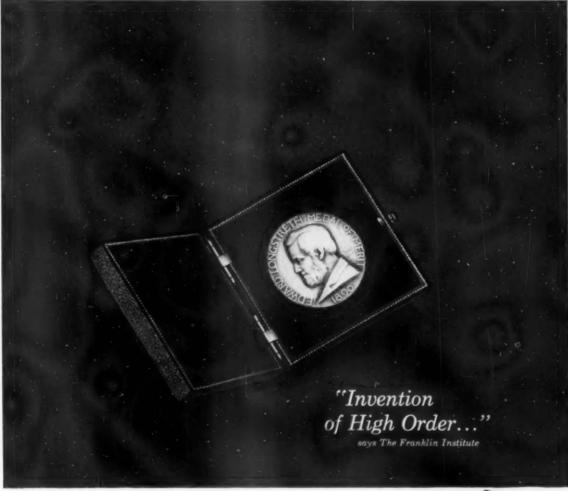
THE AMERICAN TOOL WORKS CO.

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Cincinnati 2, Ohio, U. S. A.

LATHES . RADIAL DRILLS





"For invention of high order and for particularly meritorious improvements and developments in machines and mechanical processes."

These are The Franklin Institute's words in awarding its 1955 Longstreth Medal to the inventor of U. S. PowerGrip "Timing" Belts—the outstanding contribution to power transmission of the decade.

It's easy to understand why PowerGrip received this great award. By providing near-100% efficiency in positive, non-slip, split-second timing, it has become standard equipment on a wide variety of machines and appliances. The list grows daily.

U. S. PowerGrip Timing Belts – and descriptive literature – are obtainable from factory-trained engineers at any of the 28 strategically located "U. S." District Sales Offices or by contacting us at Rockefeller Center, New York 20, N. Y.





**Mechanical Goods Division** 

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Rotor J-2L
Impact
Wrench
cuts time 23%

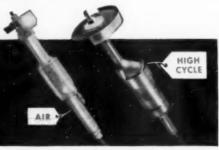
Formerly used electric nut setter for assembly of garden tools. Switch to Rotor J-2L Air-powered Impact Wrench cut job time 23%. Savings paid for tool in 12½ weeks.

New J-2L Impact Wrench is reversible . . . specially designed for minimum maintenance.

Find out how you can cut costs with the rugged, lightweight J-2L and other new Rotor Tools! Ask for Bulletin 41.

THE ROTOR TOOL CO.

CLEVELAND, OHIO



# Production Pointers



IDEAS





Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

### HOW THIS RAM TYPE TURRET LATHE WENT AUTOMATIC

### Hydraulic Drive Gives Maximum Production with Minimum Operator Attention

This appliance manufacturer was quick to take advantage of the possibilities of the new Gisholt MASTER-LINE Ram Type Turret Lathe. By using two Gisholt No. 4 machines with automatic hydraulic drive, he put production of kitchen disposal unit parts on an automatic basis.

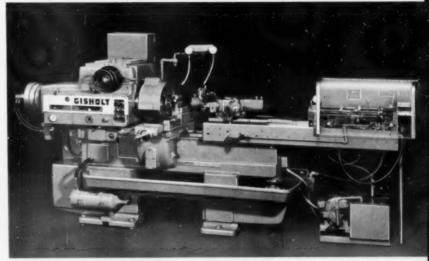
Here's how one of the parts-a cast iron flywheel-is handled. The workpiece is held in a two-jaw air chuck, through two holes cast in the face. The work locates against the back face, with spring-loaded pins eliminating vibration. The following operations are performed automatically, including necessary spindle speed changes: hexagon turret tools turn B, face D-F, form relief E, and drill, bore and tap G. At the same time, tools on the rear of the cross slide straddle-face A-C. Floor-to-floor time: 1.75 minutes. Similar machining operations at both ends of cast iron housings are also handled on these machines

This hydraulic drive unit is equally efficient on long or short runs, with average setup time of only 1.4 hours for a fully tooled hexagon turret and two cross slide tools.

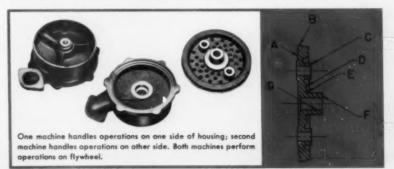
Easily adapted to any new Gisholt MASTERLINE Ram Type Turret Lathe, the hydraulic drive unit provides full automatic cycle with automatic spindle start and stop, reverse for threading... selection of any spindle speed for each station...fast approach, feed and return of turret...

and infinitely variable feeds for better finish and closer tolerance work. The cross slide operates automatically in both directions.

Equipping a standard ram type turnet lathe with automatic hydraulic drive boosts production and reduces need for close attention, skill and effort from operator.



General machine view showing hydraulic drive mounted an standard ram type turret lathe. Controls are simple, conveniently placed, and easily set up and adjusted. For complete information on hydraulic drive, ask for Form 1182. Bulletin 1174-B describes MASTERLINE Ram Type Turret Lathes.





### POWER, SPEED, VERSATILITY LICKED THIS JOB

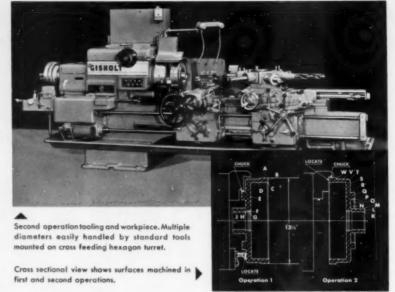
TIME-SAVING IDEAS

How Smart Tooling Combined with Cross Feeding Hexagon Turret Shorten Change-Over Time

This job would be difficult with a machine less capable than the 1L Saddle Type Turret Lathe. Instead, the workpieces-aluminum air cylinder bodies-are machined in two fast operations. Heavy cuts are handled easily by the husky 30 h.p. motor, and spindle speeds up to 1850 r.p.m. help assure a fine finish on all surfaces machined.

Special two-step chuck jaws are used. Serrated steps grip at R for the first operation and plain steps chuck on A for the second operation. Tooling for both operations is mounted on the cross feeding hexagon turret. For change-over, one tool is removed and two new tools are added on the square turret.

During the first operation, A-B-C are handled from the square turret with D-E-F-G-H-J machined from the



hexagon turret. Floor-to-floor time: 7.8 minutes

For the second operation, square turret tools machine K-L-P-Q-S-T-V-W. A single tool on the cross feeding hexagon turret is used to turn M,

plunge N-O and turn R, completing the part. Floor-to-floor time on this job: 5.5 minutes.

Special chuck jaws and carefully planned tooling on the hexagon and square turret simplify change-over.

### HOW BRITISH AUTO BUILDER SUPERFINISHES CRANKSHAFTS

**Modern Process Replaces Former Grinding Operation** 

Gisholt Model 56 Crankshaft Superfinisher in operation at Morris Motors, Ltd.

Owners of Morris autos are getting smoother, lower-cost engine opera-

tion these days-because of a Gisholt

Model 56 Single Spindle Crankshaft Superfinisher. It is interesting to note how Morris Motors, Ltd., of Coventry, England, is handling the job.

The crankshafts are centralized on the flange O.D. and supported with a center at the pulley end. Longitudinal location is against the face of the flange, and drive is taken from a hole in the flange.

Both the main and pin bearings are Superfinished simultaneously. Stone pressure is adjustable for each main or pin bearing. During the automatic cycle, the workpiece rotates and reciprocates as the stones engage the work. Crankshafts come to the Superfinisher with bearing surfaces of 30 to 40 micro inches. These are Superfinished down to 10 micro inches or less, with 35 parts an hour handled at 80% efficiency.

By Superfinishing, this auto builder cuts grinding costs on crankshafts—and gets smoother surface and improved geometry for finer performance and longer wear.





### MODERN BALANCING MADE FASTER, EASIER

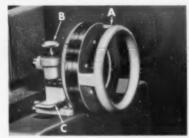
### Amount Meter Reads in **Terms of Correction Method** Employed for the job

It's a proven fact: for maximum efficiency in handling small electric motor armatures or similar parts, a balancing machine must indicate directly the amount of alteration or correction required-and the exact angular location of unbalance-in each of two correction planes.

By using a direct reading amount meter, Gisholt Balancing Machines are providing these indications more quickly and in terms easily understood by any operator. Because Gisholt uses electrical means to locate and measure unbalance effects, it is a simple matter to adjust the amount meter to read in correction units most practical for the work.

On this job, the correction unit is a length of solder. The Gisholt 1S is equipped with a metering device with which the length of solder is quickly measured and cut off. Handwheel A is turned to a number corresponding with the observed meter reading. As plunger B is depressed, the amount of solder required for correction is cut off and deposited in tray C. The operator is shown applying the metered length of solder to make the balancing correction. Workpieces like this are balanced and corrected in less than one minute floor-to-floor time.

Production balancing time is sharply reduced by Gishalt Balancers' ability to indicate unbalance in terms of practical correction units. Direct reading—plus metering device -eliminates need for charts, graphs and translating data.





Operator uses soldering iron to apply metered length of solder at the angle indicated in each correction plane. Close-up shows metering device which provides measured length of solder.

### SPECIAL FIXTURE SIMPLIFIES MACHINING OF ODD-SHAPED PARTS

### Automatic Machine Cycle Improves Accuracy, Reduces Operator Effort

Three forged steel jet arms, welded together, form the familiar oil well rock bit body. Each jet arm has a cutter mounting spindle and a highpressure jet nozzle to flush material

nozzle bore is complicated because its center line is different from the center lines of both the cutter mounting spindle and the welded rock bit body.

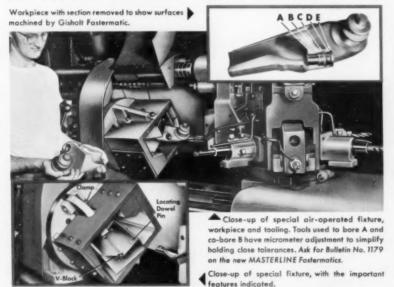
during drilling. Machining of this jet

In addition, the surface finish and bore tolerances are critical and must be closely held. Here is how this Gisholt 2F Fastermatic Automatic Turret Lathe was tooled to overcome these problems.

The workpieces arrive with two adjacent faces machined to form an angle of 120 degrees and with a hole drilled in one face for locating purposes. They are placed in a special air-operated fixture on a V-block insert, mating with the machined surfaces, locating the work on center. A dowel pin provides accurate longitudinal location. A pivot-type clamp holds the work on the shank O.D.

Machining is simple. Front and rear cross slides are eliminated to permit swinging the fixture. Hexagon turret tools bore A and co-bore B. Overhead stop actuated internal facing tools form C-D and E is chamfered to finish the job.

Floor-to-floor time on this 83/4" size jet arm is 4.2 minutes. Because several part sizes are handled, the V-block insert is replaceable, keeping change-over time at a minimum on this job.





TIME-SAVING IDEAS

# Two-Speed Motor Provides Correct Spindle Speed for Each Operation

Here is a dramatic example of what you can do with the Gisholt No. 12 Automatic Production Lathe. You may get some ideas from the interesting tooling setup shown here in the photos.

Workpieces are 2" welded pipe stems made from steel tubing. Parts arrive cut to rough length and threaded at one end. They are placed in an air-operated collet chuck, located against the threaded end and chucked on the unmachined O.D.

For the first part of the job, spindle speed is 330 r.p.m. and the feed is .022". Tools on the carriage are fed longitudinally, turning the O.D., shave-facing to length and chamfering the interior of the bore. The carriage then reverse feeds to clear the chamfer tool, and moves transversely out of the way.

## SMART SETUP PERFORMS TWO-SEQUENCE JOB IN ONE CHUCKING



Turning, facing and chamfering are completed from front carriage. Note tailstock is retracted.

The air-operated tails tock advances automatically to support the part in the chamfered bore. Spindle speed drops to 82 r.p.m. and the feed to .005". O.D. radius and seven serrations on the tube are machined in a heavy forming cut from the rear independent slide. Floor-to-floor time for the complete job is only .6 minute.

Complex feeding motions of the front carriage are easily obtained and extra handling is eliminated, with all operations performed in a single chucking.



Tailstock supports during heavy forming cut made from rear independent slide.



Left to right—rough workpiece; after turning, facing and chamfering; completed part.

### **CURVED SURFACE GENERATED BY SPINDLE-MOUNTED TOOLS**

### Fixture Mounted on Platen Table Feeds Work into Tools

Close-up of work and tooling. Smallest workpiece handled is shown in fixture. Largest is on platen table in foreground.

This unusual arrangement permits machining curved surfaces on the ends of forged steel bit head sections at high production rates.

The machine is a Gisholt Simplimatic Automatic Lathe. Work is held in a V-block fixture mounted on the platen table, with the shank end locating against a dead stop. An airoperated clamp holds the part securely in place. The platen table traverses the work to the tools and changes to feed. The severe interrupted cut is divided between four tools mounted on a special face plate fixture. At the end of the cut, the base supporting

the fixture is shifted, relieving the workpiece instead of the tools.

Several different sizes are handled. Diameters range from approximately 5½" to 12". The smallest part requires .6 minute, and the largest 1.10 minutes floor-to-floor time. For fast change-over from one size to another, tool blocks are changed, V-block is replaced in fixture, inserts are changed in clamping jaw, and locating stop is adjusted.

Flexibility offered by platen table permits "reverse" tooling setup, allowing work to be fed into tools on the spindle. Tools are pre-set to further simplify this setup.

No. 5-656



GISHOLL

Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

# with These PROVEN Products made by MOTCH & MERRYWEATHER



## M&M Triple-Chip Saw Blades Save Waste in Metal Sawing

Complete line — segmental and solid — cut-off up to 108" dia., slitting down to 3" — for any machinable material, ferrous or non-ferrous, any size, any shape, any thickness. Less tooth strain, longer blade life, substantial savings in time and costs.



## KROSLOK Milling Cutters Save Time in Precision Milling

Kroslok Face Milling Cutters and Shell End Mills cut any machinable material. Simplest design; only three members—body, blade, wedge. Serrations in body mate with cross serrations in blade. A profit-showing aid to accurate production milling.



### Three Triple C Products Save Trauble in Tool Care

Triple C Grinding Coolant, Cutting Coolant and Machine Cleaner are Cool, Clear, Clean. Anti-rust, non-greasy, smokeless, odorless, foamless, non-flammable, non-clogging, safe for operators. A notable contribution to tool maintenance.



### THE MOTCH & MERRYWEATHER MACHINERY CO.

- Cutting Tool Manufacturing Division -

Stocking Dealers in All Principal Industrial Centers
1250 EAST 222nd STREET, CLEVELAND 17, OHIO



Engineers of the Red Ring Cutter Division are concerned with gear shaving cutters exclusively. The same applies to this Division's manufacturing personnel. These men have no other job responsibility. And, in 25 years they have accumulated more experience in this highly specialized field than any other group anywhere. Machines and equipment for the production of cutters are used for no other purpose.

This experience is part of every Red Ring Cutter you buy. When you encounter a tough problem you can call for help. When you need a cutter to produce a gear with certain special characteristics Red Ring specialists will develop it.

Don't underestimate the value of this extra protection even though it isn't apparent in the price you pay for Red Ring Gear Shaving Cutters.

SPUR AND HELICAL GEAR SPECIALISTS ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

SOOD ST. JEAN . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT





the hardest—the strongest top performance at all speeds



### ANNOUNCEMENT

BECAUSE OF THE ENTHUSIASTIC INTEREST EVIDENCED IN THIS NEW MATERIAL

AT THE

ASTE SHOW . . . THE SINTOX CORPORATION

WILL HOLD

### DEMONSTRATION

OF THE AMAZING PERFORMANCE OF THIS "ALL CUT CUTTING TOOL"

### EVERY FRIDAY

AT THE MAIN PLANT 270 EAST HAMILTON ST., ALLENTOWN, PA.

TO INSURE YOUR VISIT ACCOMPLISHING ITS PURPOSE, PLEASE LET US KNOW THE TIME OF YOUR ARRIVAL AND THE NUMBER OF PEOPLE IN YOUR PARTY.



CUTTING TOOLS AND HOLDERS NOW AVAILABLE IN ANY QUANTITY

SINTOX CORPORATION OF AMERICA

270 EAST HAMILTON STREET . ALLENTOWN, PENNSYLVANIA

### A CINCINNATI PRESS BRAKE

## accurately forms this difficult shape

### Cincinnati Features

Insure this Accurate
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   Frame
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- Easy Clutch Operation
- Large Capacity Fly Wheel

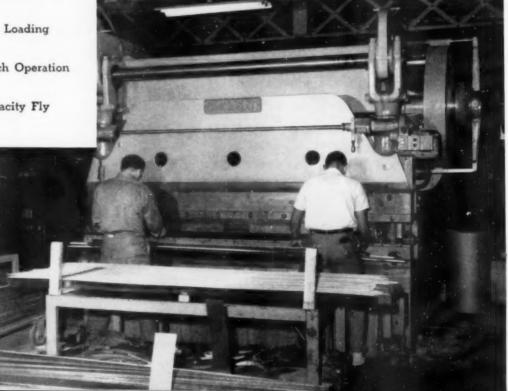
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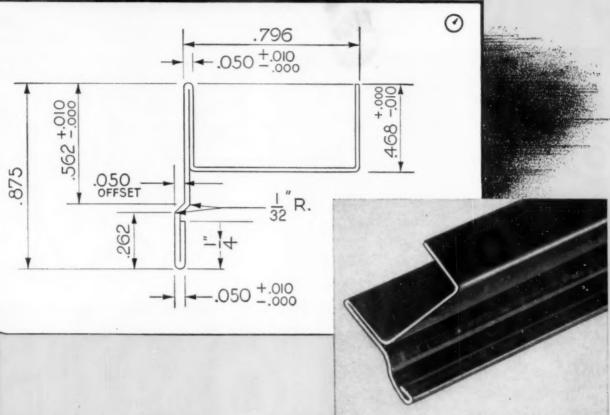
MANUFACTURING COMPANY

Metal Fabricators

CLEVELAND, OHIO

Photos courtesy the I. Clytel Manufacturing Company, Cleveland, Ohio.



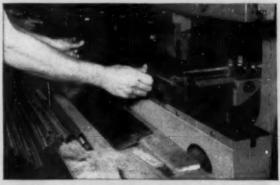


These galvanized steel channels for sliding window frames must be formed straight and true, and all dimensions held to close tolerances.

The Clytel Company say: "Our press room feels that only Cincinnati makes Press Brakes."

Consult our engineering department on your forming problems.

Write for comprehensive Brake Catalogue B-4.



One of the efficient die set-ups used on this job

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS . SHEARS . BRAKES



Here's why...
more than ever...

# MORSE

means

THE MOST"

in Cutting Tools

TUNGSTEN CARBIDE



... plus MORSE
Electrolized Tools

On jobs where there's excessive wear and abrasion, Morse Drills, Taps, Reamers, Cutters and End Mills last 2 to 10 times longer than untreated tools. Available only from your Morse-Franchised Distributor



... plus MORSE
"Vectormatic-Ground" Taps

New, exclusive Morse "Vectormatic" process gives you taps with "locked-in precision"... with tolerances held nearly 300% closer than with old thread-grinding methods. Available only from your Morse-Franchised Distributor. CARBON







Now Morse gives you everything from carbon to carbide . . . the most complete cutting tool line in industry today. And the one man who has this complete line is your Morse-Franchised Distributor.

This means that all your needs can be covered by one order . . . one invoice . . . backed up by Morse engineering service. And it also means that your Morse-Franchised Distributor can freely recommend the best cutting tool for every job in your plant . . . regardless of tool requirement. So see him now for all the cutting tools you need, including the new Morse Tungsten Carbide line, tipped or solid.

MORSE TWIST DRILL & MACHINE COMPANY • NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.) Warehouses in New York, Chicago, Defroit, Dallas, San Francisco

# MORSE

Buy them by phone from your Morse-Franchised Distributor and save ordering time



### TO PROVIDE A SOURCE FOR KELLY REPLACEMENT PARTS

Davis Boring Tool Division, long the outstanding name in tooling, now further extends its leadership in service! Acquisition of the Kelly Reamer Company of Cleveland, Ohio, permits Davis to offer a more complete cutting tool service. Sales and service for the Kelly line will be handled by the nation-wide network of Davis representatives and field tool engineers. Individual identity of the Kelly line will be maintained, assuring users ready replacement parts for Kelly equipment now in use. Make Davis your "tooling headquarters," secure in the knowledge that you will continue to receive equipment built to Davis standards of precision, productivity and unrivalled quality.

DAVIS BUYS KELLY'S TOOLING SERVICE,
AND NOW OFFERS ITS COMPLETE TOOL LINE
AND REPLACEMENT PARTS
THROUGH A NATION-WIDE GROUP
OF DAVIS REPRESENTATIVES

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COMPANY		
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	20	NE STATE



BORING TOOL DIVISION

Giddings & Lowis Machine Tool Company . Fend du Luc, Wisconsin

# Revolutionary AlRengineering Development by Ingersoll-Rand...

# Torque control **IMPACTOOLS**

MULTIPLE TORQUE SETTINGS 2 TORSION BARS AVAILABLE:

- e No. L735. Max. torque 60 ft. lbs.
- . No. H735. Max. terque 90 ft. lbs

Now you can have precision torque control with all the nut running power and speed of the world famous I-R IMPACTOOL!



\*For largues up to 550 ft. Ibs., a Sixe 5340T Torque Control Impacteol is available

... how can YOU use these ADVANTAGES ON NUT RUNNING JOBS where prescribed torques must be met?

- POSITIVE TORQUE CONTROL-a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- SIMPLE TORQUE SETTING-torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- . TORQUE SETTING REMAINS CONSTANT-for any nut running condition until the adjustment is changed.
- ELIMINATES "OVER-TORQUE"—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- LOW MAINTENANCE—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- · REVERSIBLE—full power in either direction.
- . NO CLUTCH—to wear, slip or require adjustments.



Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.

Ask your Ingersoll-Rand AlRengineer for a demonstration now . . . or write direct for more information on this amazing development.

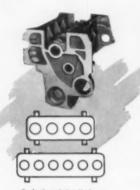
Ingersoll-Rand

11 Broadway, New York 4, N.Y.

# DUAL-PURPOSE SPECIALS.

● Here's another outstanding example of how W. F. & John Barnes Coordinated Creative Engineering and Manufacturing Service has helped cut production costs... this time for a well-known farm equipment manufacturer. These three special machines have been ingeniously designed to machine TWO SIZES of

tractor engine blocks... double-duty performance that not only means a lower original investment, but also simplifies tooling, reduces floor space requirements, and increases over-all production efficiency. Careful planning of tooling and machine components holds change-over time to a minimum...in fact,



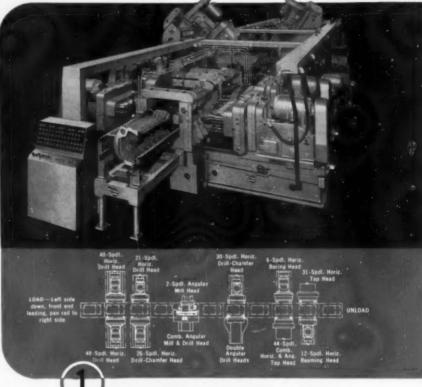
Both 4 and 6-cylinder blocks are processed on the same Barnes' Special Machines.

### SAVE TIME WITH BARNES' COORDINATED 6-POINT BUILDING SERVICE

"Shopping around" is often a costly, timeconsuming task, and all too often the results are disappointing... that's why Barnes offer a complete machine tool building service from one convenient source ... it saves time and cuts costs because all the work is coordinated in one plant. Barnes' service includes:

- SPECIALIZED MANUFACTURING FACILITIES

  —75-yeer background, large well equipped
  plant efficiently tooled to build high production machines.
- SPECIAL HYDRAULIC EQUIPMENT—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
- SPECIAL ELECTRICAL EQUIPMENT and CONTROLS individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.
- SPECIAL GAUGES, FIXTURES, TOOLS—
  designed for each individual machining problem, assure accuracy of operations at high
  production speeds.
- 5 SPECIAL HANDLING AND CONVEYOR EQUIP-MENT — designed and built to reduce work handling, effect maximum safety and efficiency.



Barnes 11-Station Progress-Thru Machine completes drilling, tepping, and milling operations on the 4 and 6-Cylinder Diesel Engine Blocks. Bushing plates, guide rails, head stops, transfer pusher fingers, and other machine components are quickly adjustable to handle both block sizes.



Builders of Better Machines Since 1872

Multiple Spindle Drilling . Boring

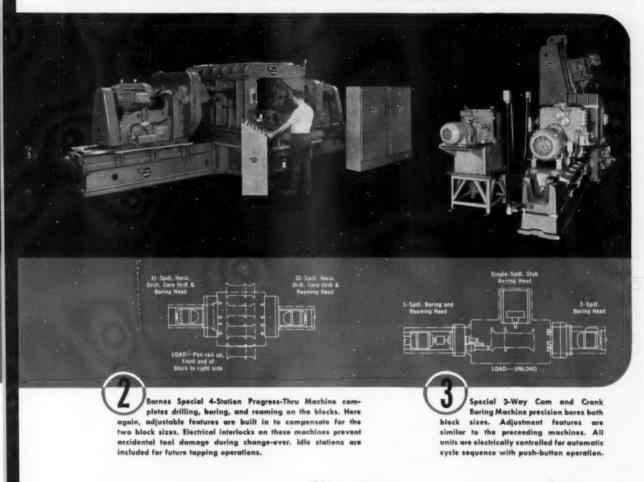
### MACHINE BOTH 4 AND 6 CYLINDER ENGINE BLOCKS

much of the tooling is common to both block sizes and does not require changing. Bushing plates, guide rails, head stops, and transfer pusher fingers quickly and easily adjust to accommodate for variations in the two block designs. Where tooling changes are required, easy accessibility and quick conversion and set-up features speed the change-over.

### OVER 75 YEARS OF MACHINE TOOL BUILDING EXPERIENCE

This unusual application is only one of many produced by Barnes... the result of over 75 years of accumulated knowledge in the highly specialized machine tool field. Creative skills, plus complete and extensive building facilities, assure you of machines possessing maximum capability for lowering production costs and improving product quality.

ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS... YOUR PROBLEMS WILL RECEIVE EXPERT AND INDIVIDUAL ATTENTION



Write Today FOR YOUR COPY of "Coordinated Machine Engineering"—
a 32-page booklet of automation equipment ideas.



W. F. & JOHN BARNES COMPANY
405 SOUTH WATER STREET, ROCKFORD, ILLINOIS

Tapping Machines . Automatic Progress-Thru and Transfer Type Machines

# TAREX

AUTOMATICS

...here's JUST ONE of the salient features of this machine which is made with SWISS PRECISION throughout:

FOUR ROBUST SLIDES!

The front and rear slides mounted on crossed ways,

permitting radial or lateral movements, or combined
to produce tapers or irregular forms. This allows the
use of single point tools in many cases in place of form
tools with their inherent side thrust. All tool slides
actuated by camming systems having adjustable ratios.

(The two upper slides are radial only).

Machine throughout is engineered to take

American-made tools!

COMPLETE TOOLING and SERVICE in AMERICA.



# BUSSELL, BOLBROOK & BENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

# get DOUBLE ACTION with ...

# HELLER NUCUTION Wavy-Teeth FILES

The "overcut" creates a pattern of coarse

and fine teeth.

HELLER Nucut Wavy-Teeth design combines both coarse and fine teeth in the same file to give fast stock removal and leave a smooth finish.

The coarse teeth cut fast, take a good bite, while the fine teeth break up the chips and permit quick clearing from the file.

This DOUBLE ACTION makes it possible to file with less effort and remove more metal with fewer strokes. Loading is minimized, chatter reduced and a smoother finish produced.

This is why HELLER Wavy-Teeth files are easier to use, last longer, cut filing costs. It will pay you to ask for HELLER NUCUT WAVY-TEETH next time you order files!



When the "upcut" is a d d e d t h e "Wavy - Teeth" design is created with larger cutting teeth and smaller clearing teeth.



Subsidiary of Simonds Saw and Steel Co.



NEWCOMERSTOWN, OHIO

BRANCHES: New York, Detroit, Chicago, Los Angeles

LOOK FOR THE

Other Famous
HELLER FILES:

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YOUR HELLER DISTRIBUTOR CAN SUPPLY ALL YOUR

FILE NEEDS

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### dixi 60

### horizontal optical jig borer

with 5 optical microscopes

### VERSATILITY

DESIGNED AND BUILT FOR: Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

#### ACCURACY

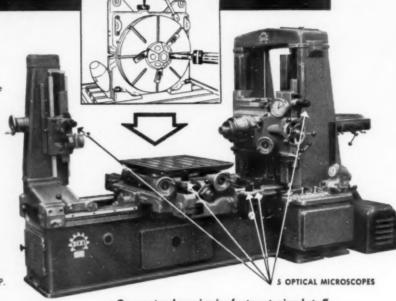
Overall accuracy of .0002"

A precision machine for JIGLESS boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32%". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

### **DIXI 450 PRECISION** OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.



- · Guaranteed service by factory trained staff
- · Engineering staff available for consultation
- · Spare Parts in New York stock
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DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States. Names available upon request.

### SEE THIS VERSATILE MACHINE IN OPERATION

at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.



### M.B.I. export & import Itd.

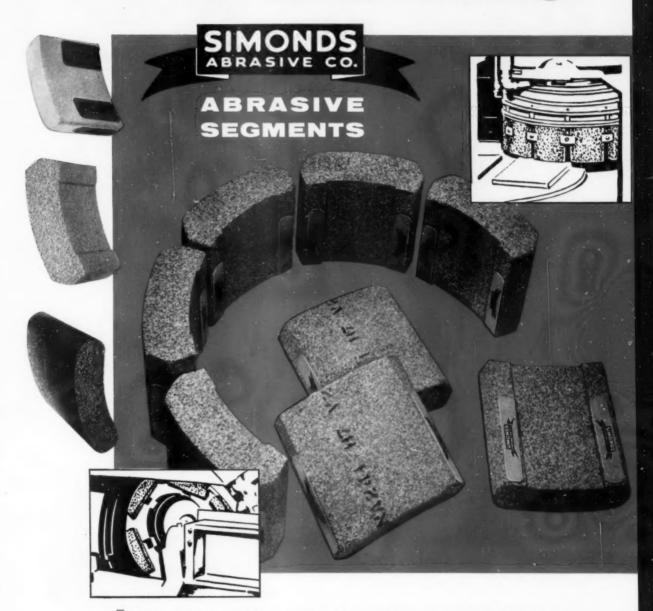
A Division of Machinery Builders, Inc.

475 Grand Concourse, Bronx 51, N. Y.

Over 20 years experience in designing & building machinery

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# Fast and Free Cutting for Surface Grinding

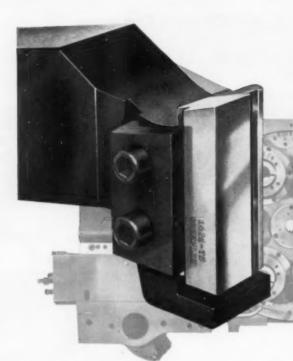


For substantial savings in surface grinding, use Simonds Abrasive Company
Segments. Mechanically accurate in shape and size, they fit all segmental chucks,
require no sulphuring, and grind more uniformly because of greater uniformity in
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stock removal on large size pieces—and for solid type segmented wheels for small
pieces chucked together. Write for bulletin ESA—188.

SIMONDS ABRASIVE COMPANY . PHILADELPHIA 37, PA.

\*-unit Warnhorson Basson, Dorrott, Chicago, Portland, Son Francisco, Distributors in Francisco Chicago







# INTER-CHANGEABLE TOOL HOLDERS

CROSS-SLIDES

# GREENLEE BAR AUTOMATICS

They Save You Set-Up Time . . . Reduce Tooling Costs

Tool holders can be quickly and easily changed from one position to another ... from one Greenlee machine to another (within their size range). All cross-slide cavities are identical ... tool holders fit these cavities exactly. Greenlee Interchangeable Tooling is more flexible ... more efficient ... more economical. On short runs especially, the savings on setup time is considerable. Greenlee engineers will be glad to show you how to attain

maximum production with a minimum number of tools and holders. Take advantage of this valuable service now.



4-SPINDLE .... 6-SPINDLE SECOND OPERATION PNEUMATIC STOCK FEED

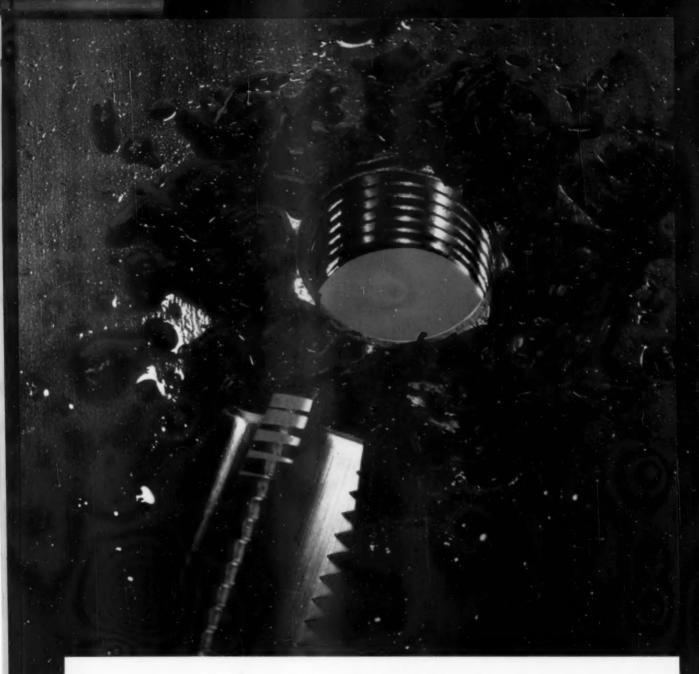


Do you receive a copy of the Greenies "Automatic News" regularly? If not, write and ask to be placed on our mailing list. Give company name and job responsibility.



GREENLEE BROS. & CO.

1985 Mason Avenue Rockford, Illinois





Threads can be no better than the taps you use. That's why it's important to use taps that are as near perfection as it is possible to make them.

"Greenfield's" close control of every measurable element of a tap is your guarantee that you are buying the best that can be made. This accuracy is bound to be reflected in the threads they tap.

IF IT CAN BE MEASURED GREENFIELD MEASURES IT

GREENFIELD TAP and DIE CORP.

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outstanding requirements

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which are indispensable in furnishing amazing speeds on work of utmost precision . . . LOWEST COST PER PIECE.

- 1) GREATER RIGIDITY
  - 2 SIMPLICITY of CONTROL and OPERATOR CONVENIENCE

3 PRODUCTIVITY

PRACTICAL . . . DEPENDABLE . . . DESIGNED

to do MORE for you at LESS COST. Built on the fundamental SIDNEY principles which have won international fame

since 1904 . . . improved to satisfy the demand of the present

and far into the future.



EQUIPPED WITH SIDNEY FLUID TRACER

THE SIDNEY MACHINE TOOL CO. . SIDNEY, OHIO

Builders of Precision Machinery since 1904



#### E. W. BLISS COMPANY

DIE SUPPLY

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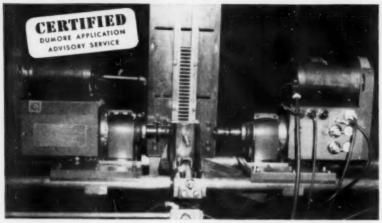
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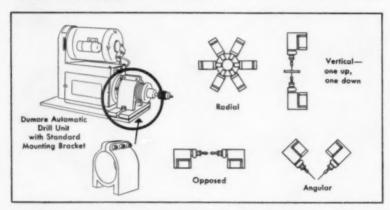
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Elifeldt Machinery & Supply Co.

# Facing-Deburring Job Speeded Up 300% with Versatile DUMORE Automatic Drill Units



This "Special" Machine, constructed from standard parts, faces and deburrs four times as many steel pipe sections as the previous method. As each part falls from the hopper to the fixture, an automatic switch actuates a clamping device to hold the part. The two Dumore Automatic Drill Units, also actuated, advance, face and deburr the ends simultaneously, and retract to starting position—all automatically.



Key to Simplicity of the Dumore Automatic Drill Unit is the standard mounting bracket which permits quick removal and transfer of Dumore Units to other shop operations. These low cost brackets quickly adapt Dumore units...at any angle... to existing shop equipment. Dumores are delivered complete and ready to be used. All controls, electrical and pneumatic are built in.

Star Tubular Products Co. of Chicago wanted to step-up production of their welded steel pipe sections. A major stumbling block was the slow job of facing and deburring both ends of each section. The process required handling each part three times: facing and deburring one end, removing and reversing the part, facing and deburring the other end. Output was 135 pipe nipples per hour. Dumore was asked to find a better, faster method.

#### Technical Application Aid

Dumore's Application Advisory Service recommended a set-up that resulted in the machine pictured at the left: two Automatic Drill Units opposing each other with a hopper feed for the pipe sections in the center. As each pipe section falls into the fixture, it actuates the Automatic Drill Units which move in and face and deburr each end simultaneously, retract to starting position, actuate work feed and advance again—all automatically.

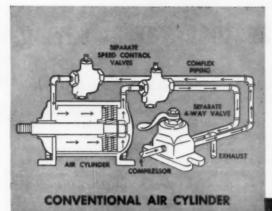
#### Production Goes Up

The set-up, as simple and inexpensive as it was, boosted production to 500 parts per hour—a 300% increase. In addition, the accuracy of this finishing process permitted the company to roll-cut their tubing, instead of square cutting, reducing the cut-off operation time by 300%!

The "multiple-use" value of Dumore Automatic Drill Units is still another benefit the customer gets. Its unique, simple mounting feature permits it to be quickly transferred and re-used for drilling, tapping, reaming and related operations throughout the shop, paying for itself over and over again.



Let Dumore's Application Advisory Service help you get increased production and lower costs on jobs like this. Write for FREE Dumore Application Analysis Kit.



# ONE LOOK and you can see the

SAVINGS





Design engineers looking for simplicity and economy in air circuit installations will find a quick answer in the two circuits sketched in this ad. One shows a conventional air circuit with separate air cylinder, separate speed control valves, separate directional valve and the piping required to install the circuit. The other shows the Bellows Air Motor—the complete air cylinder package—with directional valve and speed control valves built in, and its single air connection.

But simplification of design and installation problems is actually one of the less important advantages this compact power unit offers. The big advantages are precision control and improved performance. Response is lightning fast; action is smooth and positive. And coupled with improved performance is minimum maintenance—less time out for servicing.

The Bellows Air Motor offers you a choice of built-in directional valves: 8v or 110v electrical control, explosion-proof electrical control, manual control, or pilot valve control—in five bore sizes: 1",  $1\frac{3}{4}$ ",  $2\frac{1}{2}$ ",  $3\frac{5}{8}$ " and  $4\frac{1}{2}$ ", and in any stroke length.



This new four-color, 24-page bulletin gives full technical data on Bellowa Air Motors.

It is free on request. Ask for BM-25. Write Dept. TE-556, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto.

The Bellows Co.

AKRON 9, OHIO

1379A

FIELD ENGINEER OFFICES IN EVERY INDUSTRIAL AREA IN THE UNITED STATES AND CANADA'

## "Operations Kingsbury" - another way of saying

Drilling holes for lubrication in a rocker arm malleable iron casting is not exactly a precision job . . . but the holes must go thru! And high production is

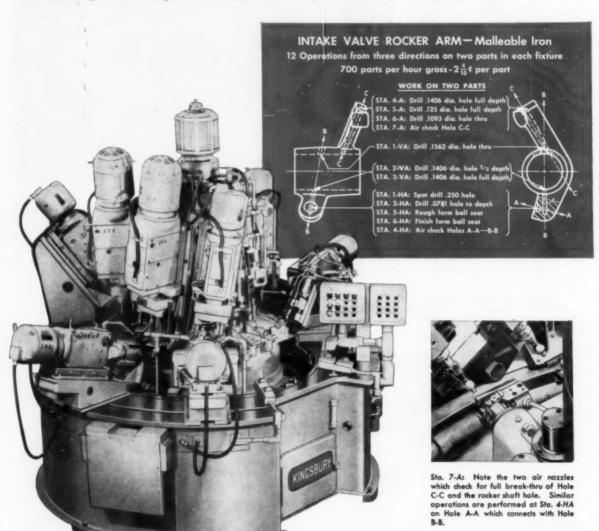
The part required four holes and a ball socket, developed at angles as shown on the print below. To obtain the highest practicable output, we used multiple spindle heads to perform identical operations on two parts at each station. Each workholding fixture secured two parts in position so that all holes could be completed at the correct angles in one chucking.

Seven work units are mounted on a 100-inch base. Eight twin work-holding fixtures are mounted on a 40-inch table, which indexes through 8 stations one for loading and unloading. The central column is stationary. Machine includes coolant pump and chip tank assemblies.

Holes B-B and C-C are drilled in three stages so as to minimize "loafing time" at any station. At Hole B-B, Sta. 1-VA drills into the rocker shaft hole. At Stas. 2-VA and 3-VA, a bushing, assembled into the shaft hole stud, guides the drill accurately across this break-thru. Hole C-C is drilled at Stas. 4-A, 5-A and 6-A. At Stas. 1-HA, 2-HA, 5-HA and 6-HA, units drill Hole A-A and form the ball socket.

To make sure that Hole C-C breaks through into the shaft hole, it is air-checked at Sta. 7-A. The junction of Holes A-A and B-B is air checked at Sta. 4-HA. Back pressure stops the machine.

The customer got exactly what he wanted: high production at low cost per part.



## "OK in every way" for low-cost, high production

Here's another Kingsbury machine with several unusual features. Print called for eight countersunk holes, spaced equally around a flange. To insure smooth seating, these holes had to be burred. This required an operation from the back of the part.

The machine has an 80-inch base with four work units. The 26-inch table has five work-holding fixtures and indexes through five stations — one for

loading and unloading.

The part is located on a horizontal mandrel through the axis hole, and is clamped in position by means of two fingers, 180° apart. These fingers are operated by an equalizing cam: they clamp and unclamp automatically. Each Kingsbury head has 8 spindles, and all operations are performed horizontally.

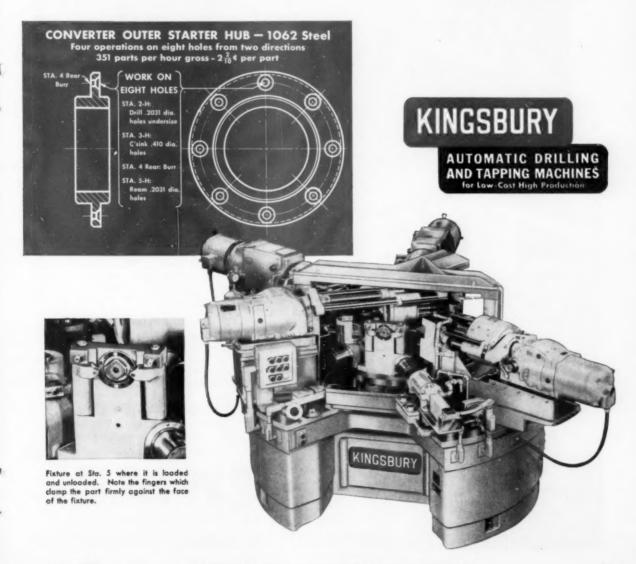
The eight holes are burred at Sta. 4 Rear. Here an auxiliary eight-spindle unit is supported by a bridge extending across the table.

Kingsbury heads, and fixtures, working as a team, can perform an amazing number of multiple operations. Case history after case history proves that this team work is a prime reason why Kingsburys, built here in Keene, develop accuracy and high production at low cost per part.

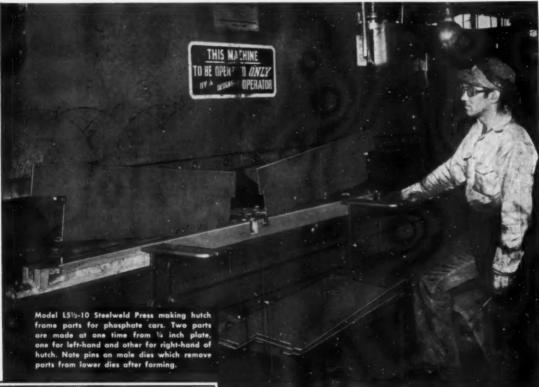
Today there are many more reasons why a Kingsbury might quickly pay for itself in your production

line. Let's talk it over.

Kingsbury Machine Tool Corp. 116 Laurel St., Keene, N. H.



## PULLMAN-STANDARD FINDS MANY USES FOR STEELWELD PRESS





A few of the many parts produced within a short period on the Steelweld Press. Curves and bends of every shape and degree are formed quickly and accurately.

"The more we use our Steelweld Bending Press, the more we learn about what it can do for us", said the Day Superintendent of Pullman-Standard Car Míg. Co., Butler, Penna. "As a result it is handling more and more of our work. We are doing a great many forming jobs on it that did not occur to us as being possible when we first installed the machine."

An endless variety of parts are produced on this press. These are mostly of 1/4 and 3/6 inch steel plate and involve curves and bends of every description for gussets, fulcrums, braces, frames, housings, etc. used in the manufacture of railroad cars.

The dies used are relatively simple and made in the company's shop. Because dies are easily changed, it usually takes about an hour to set up for a new job.

If you work with metal plate in any thickness up to one inch, for bending, forming or punching, you should get the facts on the many features of Steelweld Presses.



CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

#### THE CLEVELAND CRANE & ENGINEERING CO.

8530 EAST 281 STREET, WICKLIFFE, OHIO



### STEELWE BENDING PRESSES

BRAKING . FORMING . BLANKING . DRAWING . CORRUGATING . PUNCHING

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-44

The Tool Engineer



# Tool Steel Topics



BETHLEHER STEEL COMPANY, NETHLEHEM, PA.

# Hollow-Bar Dies Prove Economical for Forming Offset Joggle Joints



### BETHLEHEM TOOL STEEL ENGINEER SAYS:



When tools do not harden properly in heat-treatment, it's a good idea to check first for mixed steel. This can readily be done either by means of spark-testing, or by experimentally hardening another piece of the same stock.

Next, recheck the hardness. Has the tool been ground below any possible decarburization which may have developed during heat-treatment? Was enough material removed from the original bar stock to get below decarburization? Has the hardness tester been checked against standards?

Third, investigate the heat-treatment practice. The most frequent causes of low hardness are: (1) the use of too low a quenching temperature, or too short a hold at correct temperature, (2) retained austenite, due either to an excessively high quenching temperature or an excessively high carbon carburized case,

and (3) too slow a quench.

Though it pays to do the job correctly
the first time, trouble-shooting of improper hardening has its place.

The Webb Corporation, Webb City, Mo., manufacturers of industrial and mining machinery, had been fabricating a special grade of alloy steel to make roller-type forming dies, similar to those shown above. The dies formed joggle joints on shell ends, in a machine which produces an offset flange around the ends of cylinders, as a backing for automatic welding.

ders, as a backing for automatic welding. "Now there's a place," we pointed out, "where we believe BTR Hollow-Bar tool steel can effect a saving. It comes with the hole already formed in the steel, so right at the start you save a lot of machining. And as for wear and dependability, we can let BTR Hollow-Bar speak for itself."

The change was made, BTR (Bethlehem Tool Room) Hollow-Bar being put to work forming ASTM-A212 steel plate, 1/2 in. thick. At Webb they are pleased with the results — not only the saving in machining, but with Hollow-Bar's wear-resistance and ease of heat-treatment.

BTR Hollow-Bar is made from our oilhardening tool steel by a process called high-speed trepanning, by which hammerforged round bars are cored out in the center, then rough-turned on the outside.

Hollow-Bar comes ready to go, virtually as soon as you receive it. There's no lost time waiting for forged rings or discs. Nor is there any need for drilling, roughboring, rough-facing or rough-turning.

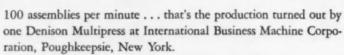


Steady Punching With Brake Die This picture, taken at Lyon Metal Products, Inc., York, Pa., shows Bethlehem Brake Die used as a punching die for ¼-in. diam holes in a steel-shelving panel. Brake Die provides good service in applications of this type because of its outstanding wear-resistance and toughness, and resistance to impact.

Another production improvement with DENISON

#### **Multipress® Automation** turns out 48,000 assemblies a day MULTIPRESS

Denison Multipress pierces, forms, cuts off, positions and spot welds stainless strap to washers



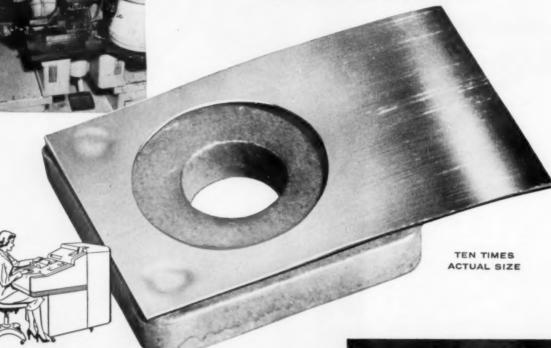
Stainless steel tape is fed through a hitch feed into a punch and die set where it is pierced, shaped, and cut off forming a damper guard to cushion the action of a relay armature. It is then positioned under welding electrodes and welded to a square steel washer.

All operations are automatic , . . accurately timed to the stroke of the ram.

Ask a Denison field engineer to show you how to put Multipress to work in your plant. He will demonstrate exactly where and how you can save money on your operations . . . now. Write us.

#### DENISON ENGINEERING COMPANY

1182 Dublin Road . Columbus 16, Ohio A Subsidiary of American Brake Shoe Co.



HYDRAULIC PRESSES . PUMPS . MOTORS . CONTROLS

# Standardige with STANDARD





When you're faced with a cutting tool problem, the STANDARD TOOL MAN—backed by 75 years of industrial experience—will recommend a practical, profitable solution.

Your Standard Tool Man is familiar with all types of metal-cutting operations and is always at your service without obligation.

Call him!



YOUR STANDARD TOOL DISTRIBUTOR STOCKS THE COMPLETE LINE

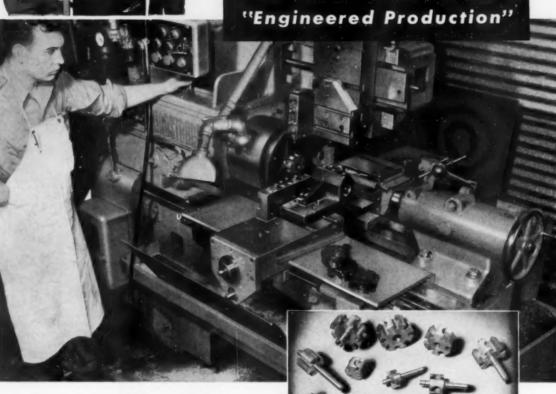
STANDARD TOOL CO.



FACTORY BRANCHES IN: NEW YORK . DETROIT . CHICAGO . DALLAS . SAN FRANCISCO

THE STANDARD LINE: Twist Drills . Reamers . Taps . Dies . Milling Cutters . End Mills . Hobs . Counterbores . Carbide-Tipped Tools . Gages





#### For Instance This Sundstrand **Automatic Lathe Increased** Production 21/2 Times

Here's a small lot turning job done on a Sundstrand Model 8A Automatic Lathe. Pump rotors and covers are turned and faced in lot sizes of 100 to 500 pieces. Previously these parts were run on 3 different conventional turning machines using 3 operations. With this Sundstrand Automatic Lathe, the same amount of work is done 21/2 times faster.

# SUNDSTRAND







# WHY SUNDSTRAND CAN OFFER ECONOMICAL SOLUTIONS TO PRACTICALLY ANY TURNING JOB

Many years of designing machine features to increase production and lower costs on all classes of turning problems has provided Sundstrand with the experience to design and build equipment for practically any turning job. A few of the diversified types of Sundstrand equipment provided for different turning problems are shown on this page.



#### **Special Turning**

This Special Sundstrand Lathe is for automatic turning, reaming and marking rotor assemblies.

Machine has many unusual features such as automatic loading, machining, gaging, unloading and re-setting of tool slides to adjust for tool wear.

#### How to get the right machine for your work Investigate the many services and physical equipment



Investigate the many services and physical equipment available from Sundstrand "Engineered Production." Call in a Sundstrand engineer, and write for bulletin 767. There is no obligation for this service.

#### Tracer Turning

For multi-cycle single point turning of irregular shapes, Sundstrand Automatic Lathes can be provided with a template controlled tracing slide mounted to the regular front carriage. With this attachment and controls, ruff, semi-finish and finish cuts can be taken with one turning tool in an automatic cycle. The regular rear slide can be used to square up shoulders, chamfer, etc.

#### Punch Card Control

All machine functions of this multi-cycle single point lathe are controlled from punched cards. Set-up time and mechanical skill required to produce parts are reduced to a minimum. Write for folder describing this interesting machine.



#### **Automatic Loading**

Here's one of the many automatic loading and unleading units designed for Sundstrand Automatic Lathes to handle a specific part. Units of this type simplify machine operation and provide a complete automatic cycle for high production.

#### TRIPLEX RIGIDMILS 1

#### SPECIAL MACHINES





# SUNDSTRAND Machine Tool Co.

2540 Eleventh St. . Rockford, III., U.S.A.



now you can save valuable one operation ahead...with

# Carlton

The Carlton-Leber speed-feed pre-selector system speeds up drilling by permitting operator to set speed and feed for the next operation while the machine is still under cut. With this productive new device, the time lost heretofore in setting speeds and feeds is now used for almost continuous drilling. Now you stop the spindle only for changing cutting tools.

**Pre-selector** Here's how it works: while the machine is cutting on one operation, the operator sets speed and feed dials for the next operation. When present operation is complete, he stops the

## Carlton Radial Drills now come with your choice of 3 different



Manual gear shift: 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.



Pre-select gear shift: 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.

drilling time by giving operator a chance to set ingenious

# pre-selector

spindle, changes the drill, and starts spindle again. At that instant, the gears automatically shift to the correct speed and feed.

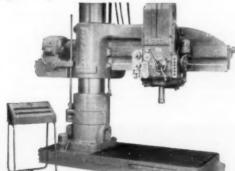
Additional time is saved by instantaneous gear shifting made possible by mechanically oscillating the change gears which assures quiet gear mesh.

Programming Another Carlton-Leber system—the programming unit—can be used in connection with the pre-selector. The programming system pre-selects speeds and feeds for an entire drilling program including as many as 20 or 30 operations.

With the introduction of the Carlton-Leber preselector and programming systems, you can now buy Carlton radial drills with your choice of three different types of speed-feed control as illustrated below.

You can see the pre-selector and programmer in operation. Ask your Carlton distributor to arrange a showing of the new Carlton movie. Or, write us direct for descriptive free bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

speed-feed controls . . .



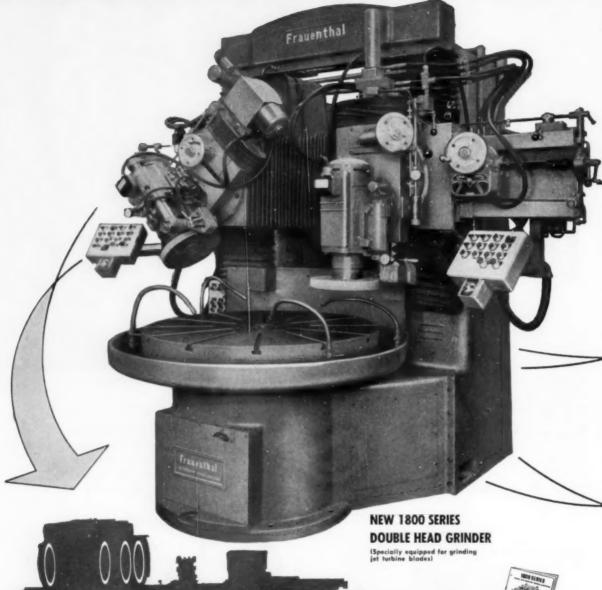
Pre-selector and programming gear shift sets up correct speeds and feeds for a complete sequence of operations.

Carlton

horizontal and radial drills



See 'em in action! Ask your Carlton distributor to arrange a showing of the new Carlton programming film. PRECISION-GROUND



**MACHINE TOOLS** 



Free Catalog!

For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.

Frauenthal Division

## COMPONENTS . . .

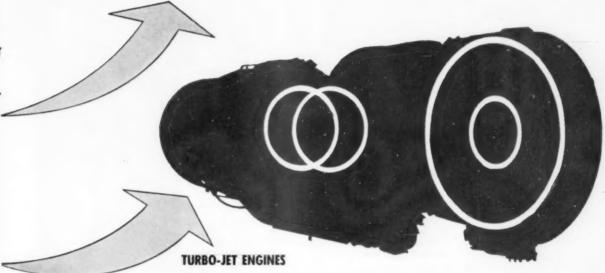


WHATEVER YOUR FIELD OF INDUSTRY — With Frauenthal precision machines, you're able to grind diameters and related surfaces without changing setup of the workpiece and obtain accuracies within .000200". This assures consistently uniform precision in concentricity, parallelism and roundness.

The accuracy and versatility of Frauenthal equipment is unequalled in the machine tool field. Difficult work-pieces — those impossible to handle on conventional horizontal grinding equipment — are handled with comparative ease on these unusual machines.

Four different series of machines are available affording table sizes up to 140". The 1800 Series Double Head Precision grinder, illustrated at left, is now available with a maximum swing of 72" and various table sizes to suit customer specifications.

For complete details, contact Frauenthal of Muskegon, Michigan.



MACHINE TOOLS — Modern day machine tools are required to produce piece parts to greater accuracy than ever before. Therefore, machine tool components must be more precise to the nth degree. With Frauenthal grinders you can grind collets, chucks, spindle sleeves and similar components under simulated assembly conditions to assure concentricity, parallelism and roundness. Eliminate costly and time consuming hand scraping and grind plated parts prior to and after plating for increased wearability.

TURBO-JET ENGINES — Diffuser cases, rotors, compressor discs, vanes, etc., are components of jet engines ground on

Frauenthal equipment. Thin section parts, which are unstable due to their design, are ground on the horizontal rotary table of the 1800 and 3100 Series machines. The compound and spindle angle setting features permit the grinding of surfaces normally inaccessible on conventional equipment.

ORDNANCE — Large bearings and housing components for ordnance applications are ground on the 1800 and 2200 Series grinders. Applications vary from aircraft gun turret bearings to the large turret bearings required for tanks, motorized gun carriages, radar and naval gun mounts.

### THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN

Guarantee TOP Performance and Maximum Life!

# Specify THESE TOP QUALITY FEATURES ...

(Standard on Miller Cylinders at no extra cost)



Specify
"TEFLON" WIPERS
On all Air and
Hydraulic Cylinders

Specify
TEFLON
HYDRAULIC
ROD SEALS
On all Hydraulic Cylinders

Specify
RUST
RESISTANT
SURFACES
On all Air and
Hydroulic Cylinders

You may wish to route this entire page to the proper department in your company, by using this handy form.
Additional copies on request.

To (Dept.)—
"On all our future cylinder requirements, please specify the above quality features."

Signed\_

#### Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. Available from Miller at no extra cost.

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. Available from Miller at no extra cost.

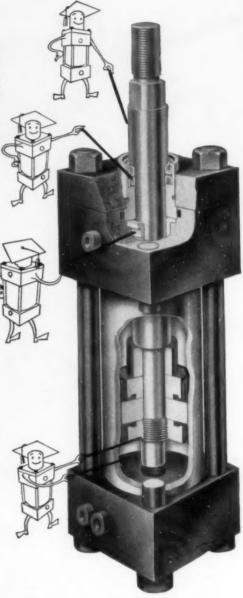
#### Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. Available from Miller at no extra cost.

#### Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish at no extra cost on all Miller cylinders. (This finish not recommended for water service)



NOTE. On all Miller Hydraulic Piston Seals: Leather Cup Seals are standard, Piston Ring Seals are optional at no extra cost, and "Teflon" Cup Seals are available at extra cost.

Member of the National Fluid Power Association

#### SALES AND SERVICE FROM COAST TO COAST

CLEVELAND . YOUNGSTOWN . DAYTON . TOLEDO . CINCINNATI . COLUMBUS PITTSBURGH . PHILADELPHIA . BOSTON . HARTFORD . NEW YORK CITY BUFFALO . ROCHESTER . MINNEAPOLIS . GRAND RAPIDS . DETROIT . FLINT FORT WAYNE . SOUTH BEND . INDIANAPOLIS . MILWAUKEE . LOUISVILLE KANSAS CITY . SEATTLE . LOS ANGELES . SAN FRANCISCO . BALTIMORE DENYER . ST. LOUIS . MOLINE . CHICAGO . HOUSTON . ATLANTA TORONTO, CANADA and OTHER AREAS

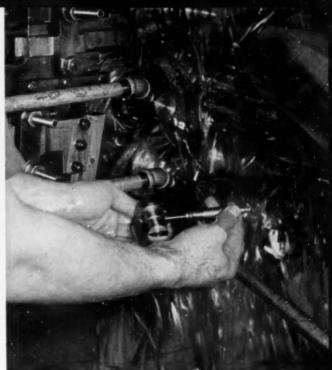


#### MILLER FLUID POWER DIVISION

11110 = 2010 N. HAWTHORNE AVE., MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS . BOOSTERS . ACCUMULATORS





**Black cutting cil** (left) makes close control difficult. Operators dislike dirty operating conditions it creates. Close control is easier and workers are happier with transparent Sunicut cutting oil (right).

# WHY USE A BLACK CUTTING OIL WHEN YOU DON'T NEED IT?

## Sunicut oils give you better visibility without sacrificing machining efficiency.

When trying to maintain close control over machines producing precision parts, operators can be handicapped by "black-oil blindness". It is hard to see the tools, the workpiece, and the finishes. Checking close tolerances is difficult when the graduations on micrometers and gauges are obscured.

Worse still, as the operator sees it, are the dirty working conditions caused by dark oils. His clothes get saturated with hard-to-remove stains, and his hands are black from one end of the shift to the other.

Transparent Sunicut oils help keep your operators happy and will make close control easier ... and transparent Sunicut oils will do the job with no sacrifice in machining speed or finishes.

To get the full story on Sunicut oils, see your local Sun representative, or write Sun Oil Company, Philadelphia 3, Pa., Dept. I-41.



SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL



For any machining or grinding operation ...

# THERE'S A SUN OIL THAT'LL GIVE YOU HIGH EFFICIENCY AND LOW OVER-ALL COST

No two machine shops have exactly the same problems when it comes to selecting cutting oils...even when they're running the same job. And, until somebody comes up with the truly universal cutting oil, you can't afford to disregard the importance of oil selection. Here's how Sun can help you.

First, Sun makes a complete line of emulsifying and straight cutting and grinding oils. Second, your Sun representative, backed up by field engineers, has the necessary practical experience to recommend

the oil that will give you both high machining efficiency and low over-all costs.

For the full story about Sun's cutting oils, see your Sun representative...or write Sun Oil Company, Philadelphia 3, Pa., Dept. I-42.



INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL



with R and L
TAP AND DIE HOLDERS



Ready to start threading operation, clutch slightly engaged at C.



Instantly engaged to full contact between A and C as soon as tap or die engages work.



Fully released thereing ample clearance between tentors points of clutch. New Release Mechanism allows for easy adjustment for right or left hand tapping and threading.

Instant engagement
at full contact . . . Fast
kick out clutch . . . No spring
plungers to wear or break . . .
No small screws to work loose!
Available with shanks of from 5%" to 1½"
in releasing and non-releasing types as well as

releasing die holders for acorn dies.

Send for new catalog

R and L TOOLS 1825 Bristol Street, Philadelphia 40, Pa

Send new catalog

Please have representative call.

NAME

COMPANY .

ADDRESS

TE-5

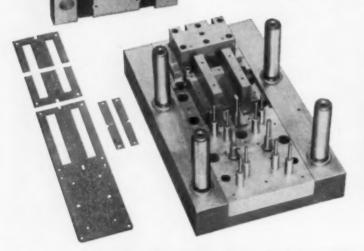
Rad TOOLS

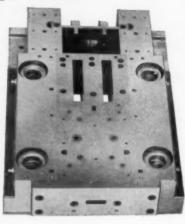
1825 BRISTOL STREET + PHILADELPHIA 40, P

TURNING TOOL - CARBIDE OR ROLLER BACKNESTS - RELEASING OR NON-BELEASING TAP AND DIE MULBERS - BELEASING DIE HOLDER FOR ACCURE DIES - UNIVERSAL TOOL POST - CUT-OFF BLADE HOLDER - RECESSING TOOL

### Kennametal Grade K92 outwears steel 15 to 1 in stamping "E" and "I" laminations

Operating at 200 strokes per minute in a 60-ton press, a Kennametal die produced 1,000,000 "E" and "I" pieces per grind, against 95,000 for steel, and a total of 150,000,000 units, against only 10,000,000 for steel. That is a 15 to 1 ratio in favor of Kennametal. Material involved was .0185" thick silicon steel. Kennametal Grade K92 was selected because of its high strength, long life, ability to stay sharp for extended periods of time and produce accurate laminations free of rough edges.

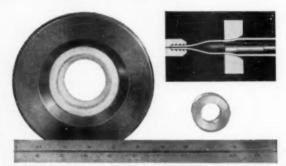




### KENNAMETAL\* Die Grades provide outstanding die performance

- sustain high production rates
- maintain accuracy over extremely long production runs
- decrease operating costs

Kennametal Die Grades have many distinctive qualities: high hardness, unusual transverse rupture and crushing strength, high modulus of elasticity, great resistance to abrasion, ability to take a high polish and a "slippery" quality to resist galling. Varied combinations of these properties are found in the nine Kennametal Die Grades in the "80" and "90" Series. There's a "right" grade to stand up at high production rates, over long runs, and produce parts of consistent accuracy and finish on any application . . . blanking, stamping, compacting, cold heading, swaging, forming, drawing, and so on. Our die engineers will gladly work with you on your die problems, and recommend the right grade for each job. Call your nearest Kennametal office or write KENNAMETAL INC., Latrobe, Pennsylvania. \*Registered Trademark



Tube drawing increased from 500 feet to over 75 miles; Nib cost cut from 40¢ to 1¢ per 100 feet of tubing

Against average life of only 500 feet of tubing for chrome coated steel mandrel, a mandrel nib of Kennametal Grade K84 showed only .003" wear after 75 miles of tubing. In addition to reducing nib costs from 40¢ to 1¢ per 100 feet of tubing, great savings were realized on reduced scrap and lower machine downtime for mandrel changing. Kennametal Grade K84 was used for cold drawing 1½" diameter, .083" wall seamless steel tubing to 1½" diameter.

Ask for Booklet B-100

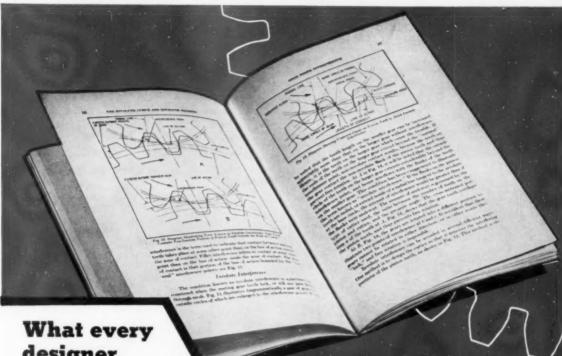






KENNAMETAL ... Partners in Progress





designer should know about

## involute gears

The properties of the involute curve as a gear-tooth profile offer many possibilities in the design of gears. To take full advantage of them, you must know the three basic elements of gear design and the fundamental laws of the involute curve.

These are stated in "The Involute Curve and Involute Gearing," a complete treatise on Involute Gear Design. The contents of this booklet also include such useful subjects as the function of gearing, the application of the involute to gear teeth, the Gear Shaper Cutter, generating involute gears on the Fellows Gear Shaper, checking profiles on Fellows Involute Measuring Instruments and definitions of gear tooth elements. A copy is yours for the asking. Just write any Fellows Office.

You should also know that in addition to providing speed and accuracy in generating involute gears, the Fellows Gear Shaper provides an economical means for generating many non-involute shapes such as sprockets, cams and other irregular contours.

THE FELLOWS GEAR SHAPER COMPANY 78 River Street, Springfield, Vermont

Branch Offices: 319 Fisher Building, Detroit 2 5835 West North Avenue, Chicago 39

2206 Empire State Building, New York 1 6214 West Manchester Avenue, Los Angeles 45

THE PRECISION Cours Gear Production Equipment

E. F. makes BAY STATE

SECTRONIC FORMULA

WESTBORO, MAJOR

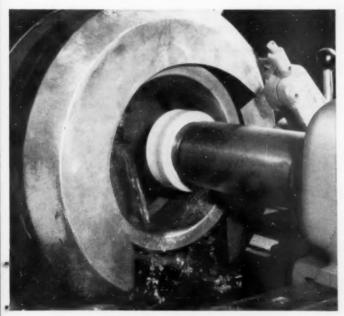
"H" is the latest "Wheels of Progress" development. Send for your copy of this illustrated descriptive booklet.

# **Grinding Wheels BETTER!**

"Electronic Formulation" is the first use of an electronic "brain" for flawless calculation of grinding wheel ingredients. Its precision is unmatched in the industry.

#### "EF" GIVES YOU SUPERIOR ACCURACY IN:

- ★ SPECIFICATION . . . When your grinding requirements are analyzed, BAY STATE abrasive engineers have the industry's sharpest specifying tool. "EF's equal-step, straight-line progression of grade and structure makes this new degree of accuracy practical.
- ★ MANUFACTURING . . . When wheels are made to meet your requirements, each ingredient is determined to the millionth of a pound! The 160 calculations per order are automatically self-checked. You can be certain that the ingredients of your wheels are exactly as prescribed.
- ★ DUPLICATION . . . . . When you reorder BAY STATE wheels, the perfect "memory" of electronically punched cards assures absolute accuracy in duplicating . . . and faster order processing too.



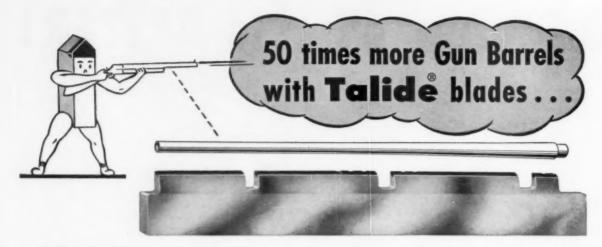
"EF" brings new dependability and accuracy to all precision grinding, such as this critical internal operation.

For full engineering benefits from this latest "Wheels of Progress" development, call in your local BAY STATE DISTRIBUTOR.

## BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.

Branch Offices and Warehouses — Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh Distributors — All principal cities In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford. Ont.





Leading Arms Producer reports outstanding service life with Talide centerless blades over past 10 years—outperforming and outlasting all other work support blades.

Part...... 12 gauge shotgun barrel.

**Operation.....** Grind entire gun barrel simultaneously to series of compound angles.

Machine..... No. 5 Cincinnati Centerless Grinder.

Blade...... Special Talide-tipped work support blade 34%" long, having 9 steps and 10 compound angles ground to .0001" tolerance.

Results....... Talide-tipped blades last 150 days per grind—hardened steel blades 3 days. Several Talide blades have been in continuous production for over 5 years—being retipped with a new Talide metal wear strip every 12 to 18 months.

Tolerance..... Talide blades, due to their negligible wear over long periods of service, enabled the above Arms Producer to maintain the extremely close tolerances required on the above part—and at less cost than possible with any other tooling.



One-piece Talide strip (up to 100" without seams) prevents scoring and scratching. Write for new 84-page Catalog 56-G or ask for sales engineer to call. . . . Metal Carbides Corporation, Youngstown 12, Ohio.

#### 1,000,000 CUTS WITH TALIDE SHEAR BLADES!

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Standard Talide-tipped blades are available from stock in over 50 styles and sizes for both Cincinnati and Landis Centerless Grinders and for either infeed or thru-feed work. Special blades to handle parts having steps, tapers or profiles can be made promptly to special order. Blades can be supplied in lengths up to 100" and ground to any tolerance or shape.

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## For The ROUGH Hobbing Jobs!



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It's designed to hob spur or helical gears up to 1% DP with a left or right hand maximum helix of  $45^\circ$ .

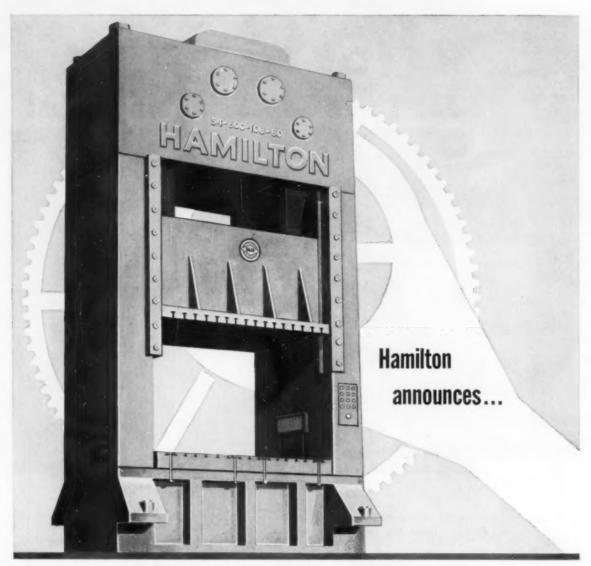
The Model "R" features fast loading and unloading, ready access to index and feed change plus easy operation and maintenance.

Write for your free brochure giving the detailed capacities and specifications of this new heavy-weight hobbing machine.

#### SPECIFICATIONS

Maximu	m outside diameter
with	tailstock column 16"
witho	ut tailstock column 18"
Minimu	m C/D hob to work 11/2"
Maximu	m C/D hob to work 12"
Travel	
Maximu	m diameter of hcb
(3-1,	6-1, or 12-1 backgearing) 10" x 10"
DP ran	ge 1¼ DP to 16 DP
Maxim	m manual (or electric) shift of hob 6"
Diamet	er of hole through work spindle 2"
Machin	e weight 13,000 lbs.





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New from Hamilton . . . two major mechanical press developments in one . . . a complete new line of welded steel, top drive, full eccentric presses from 300 to 4000 tons . . . an exclusive new double lube system protects each press for extra-long, trouble-free service and for smoother, precision performance.

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In addition, this line features Hamilton's new air

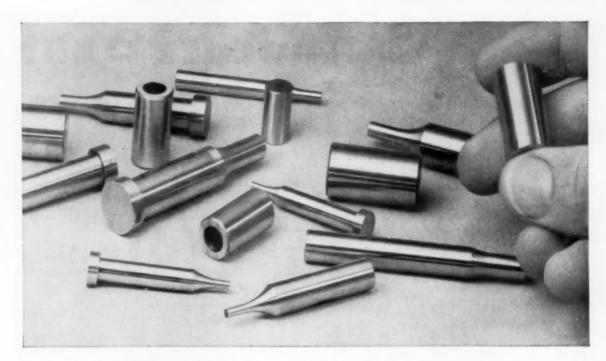
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# How the country's largest exclusive producer of punches and dies changed complaints to contracts

... with Graph-Mo® steel

PORTER Precision Products, Cincinnati, Ohio, is the country's largest exclusive manufacturer of punches and dies—37,000 different sizes in stock. Formerly, Porter produced these products from water-hardening and other high-carbon tool steels, but found that such steels presented distinct disadvantages. For example, they distorted in heat treating, were relatively expensive and difficult to machine, and did not meet customers' demands for longer life.

With a view to correcting these problems, Porter engineers adopted Graph-Mo®—one of four graphitic tool steels developed by the Timken Company—as a standard for the manufacture of punches and die buttons. Because it contains free graphite, Graph-Mo is easier to machine. And punches and dies made of Graph-Mo don't scuff or

gall. From every aspect, Porter's adoption of Graph-Mo steel has proved eminently successful.

Graph-Mo outwears ordinary tool steels on an average of three to one. Millions of tiny particles of diamond-hard carbide—one of the most wear-resistant substances known—give Graph-Mo steel longer service life.

Graph-Mo may be the solution to your punch and die problems. For more information about all four graphitic steels developed by the Timken Company, and their uses in dies, punches, gages, and machine parts, write for the new Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

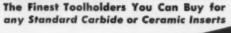


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#### Styles to handle 90% of Your Machining Operations

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**Comparable Toolholder** 



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Straight Facing



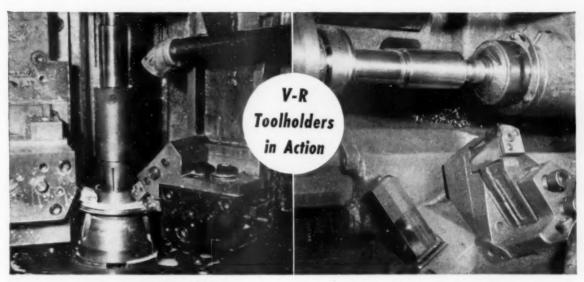


15° Lead Angle Facing



The Tool Engineer

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Insert is removed and replaced in seconds. It is automatically indexed just by slipping it in place!



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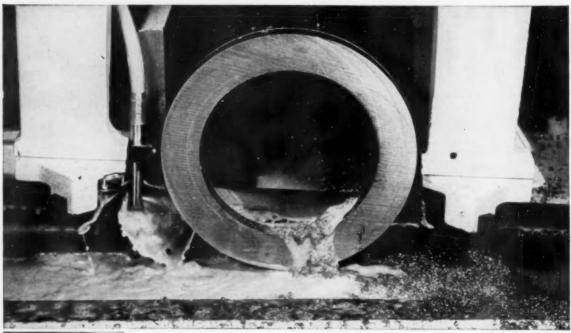
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Fast, Continuous Cutting this new saw band slices through metal at rates up to 14 sq. in. per minute on mild



Big Material Savings - thin band eliminates excessive stock waste, pays for itself in the savings!

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Never before could you cut so fast at so low a cost as with new DoALL Demon Saw Bands of High-Speed Steel. They'll withstand red heat without losing hardness-you can cut up to 10 times faster than with carbon steel saw bands and outperform any other type of saws on a cost per cut basis!

Here are some examples of Demon blade performance on DoALL Power Saws:

21/2 Times Faster-A midwest plant cutting mild steel reports, "Cut-offs on the DoALL are 21/2 to 3 times faster than on our power hack saws . . . blade cost per square inch slightly less than 1/4 of a cent."

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See a Demonstration-you can watch DoALL Demon H.S.S. Saw Band performance right in your own plant at no cost or obligation. Just call your local DoALL Store, or write: The DoALL Company, Des Plaines, Illinois.

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This "guarantee" is provided by 3 new-design
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Production limits are often set in the grinding room.

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# The Tool Engineer

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Take 530 well-planned industrial exhibits manned by competent engineers and demonstrators, and multiply by an average of 15 items each. Add 27 thoughtfully planned technical sessions where 60 stimulating papers were presented. Also add 15 specially conducted plant tours. Mix well with 36,000 manufacturing executives and engineers, and the inevitable result is ideas unlimited.

"Hats off," to those who participated in ASTE's recent Industrial Exposition and Annual Convention in Chicago. Our special thanks to the exhibitors for their splendid displays, the technical speakers for their informative and stimulating thoughts, the host chapter committee for its arrangement of the plant tours and other details, and to our headquarters staff for their over-all direction.

Ideas unlimited were available to improve quality, reduce costs and increase production in order that the people of the Free World may continue to enjoy more and more of the good things of life with less and less

Mr. Executive and Mr. Engineer, put those ideas to work before they are crowded out by daily problems and we will have added immeasurable strength to our system of free enterprise.

HE Memillen

Bores, Drills,
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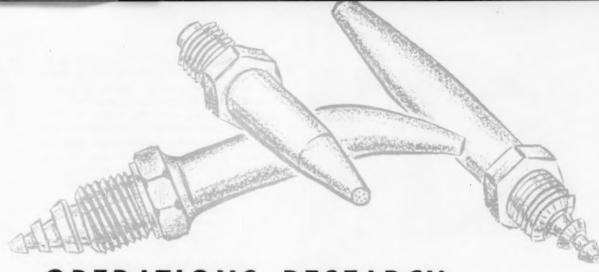
- No. 2
- \* Rough and semi-finish bores cylinders; rough and finish counterbores valve ports; drills, chamfers and reams all holes.
- \* 129 pieces per hour at 100% efficiency.
- Machine Number One has 4 stations; 1 for loading, 3 for drilling, chamfering and reaming. Machine Number Two has 7 stations: 1 for loading and 6 for machining.
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- Other features: Construction to JIC standards; hydraulic feed and rapid traverse; hardened and ground ways; automatic work cycle.

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#### **OPERATIONS RESEARCH**

... as it is applied to production problems

By Alan H. Gepfert and Charles H. Grace Engineering Administration Dept. Case Institute of Technology Cleveland, Ohio

Operations research has been clouded by mystery so that difficulty has been experienced in pinpointing what it is and what it can do. In this article, the basic philosophy of operations research is discussed. A simple example is used to illustrate the practical application to production problems.

O PERATIONS RESEARCH introduces a scientific approach to decision making. Such research provides management with quantitative analyses of problems that otherwise would be handled largely on the basis of intuition or experience. These analyses give management more information and result in greater effectiveness.

Comprehensiveness and use of models are key characteristics of the operations research approach. The researchers' thinking must take into account all important relevant factors of a problem, which frequently requires transcending departmental lines and traditionally accepted notions. Problems are solved by making an abstract model to represent the problem situation and manipulating the model rather than the real situation.

A comprehensive approach is required if "best" solutions are to be achieved. The company should be regarded as an integrated functional unit and departmental lines should be crossed by operations research if the problem logically crosses the lines. This calls for a "think big" attitude and continual questioning on the part of the researchers. They must view each phase of the company's operations with the question, "Why is it done this way?"

In the complex business enterprise of today, many interrelated factors must be considered during the solution to any problem. Approaches based on intuition and experience derive their strength from this fact. It is impractical to treat the whole physical enterprise as a pilot plant in order to determine the potential effects of contemplated policy but the executive must consider all factors when studying the problem. Such analyses can be made much more powerful by providing a comprehensive model that can be manipulated to evaluate different policies without actually putting them into practice.

Development and use of models are as important to the operations research approach as is compre-





Alan H. Genfort

Charles H. Grace

Since receiving his MS in engineering administration from Case in 1953, Mr. Gepfert has continued his studies with special emphasis on operations research. He is an instructor and a member of the Case Operations Research Group. His experience includes both military and industrial application of operations research.

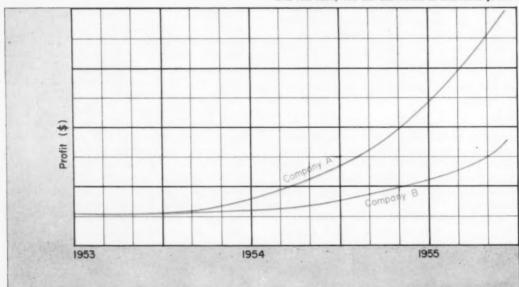
Dr. Grace's experience includes work as a research section head, product-design section head and manager of a small electronics corporation. He received his doctorate in electrical engineering from Carnegie Institute of Technology in 1952. hensiveness. Models can be verbal, pictorial, mathematical or physical. With models, endless discussion and conjecture can be replaced by precise statements about the factors that really matter. In operations research, called OR, models are set up to use accepted, scientific problem-solving techniques. For this reason, mathematicians, physicists and sociologists can solve production problems even though they have little or no production experience. In fact, ability for detached scientific thinking is of more value to an OR team than particular experiences in separate fields of specialization.

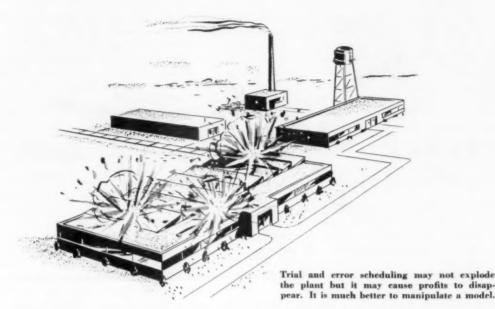
Although mathematical formulation is not essential to all OR studies, mathematical models are often best because they lend themselves to quantitative analysis. Introduction of mathematics into business problems through OR can be thought of as partial mechanization of the decision process.

When business problems are expressed in terms of mathematical equations, effects of individual factors can be determined and effective policies can be established. When the problem situation changes, it is usually not necessary to start with a new model. New data can be processed in accordance with established procedures and a new solution can be calculated. If factors change greatly or if new factors are added, the first analysis can be used to indicate how the procedures should be changed.

Problem-Solving Procedure: A typical operations research problem-solving sequence is usually composed of about seven steps. The steps are not necessarily listed in order and frequently they are not as distinct as an outline would suggest. The

Company A has used OR methods for several years and can easily see the difference in increased profits.





best approach for a particular problem often requires jumping back and forth from step to step. The action indicated by each of the following steps, however, should be considered at some time during the solution:

- 1. Orienting
- 2. Clarifying objectives
- 3. Formulating the problem
- 4. Designing the model
- 5. Collecting data
- 6. Solving model and evaluating answer
- 7. Implementing

Consulting OR teams would necessarily approach a problem from a different point of view than an OR team made up of company personnel. The outside team would have neither preconceived ideas nor any background of specific company data. Steps in the problem-solving sequence will be discussed in light of requirements of an outside OR team.

The OR team must become oriented to the particular company and people involved in the problem. The company's functional organization is studied by tracing communication channels and areas of responsibility. Organization charts are sometimes helpful in this but they do not necessarily give the complete picture. The group should also learn the operation and production methods by which the products are made and transferred to the consumer. Such activities require close cooperation of people in all parts of the company.

Clarification of the objectives of any particular decision requires statements of objectives by the people who will make the decision and by those who will be affected by it. Such statements should be compared for consistency and ranked in terms

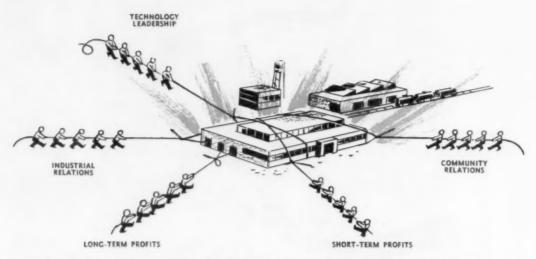
of importance. Without such correlation, an intelligent statement of the problem is impossible.

When the objectives have been weighted in terms of importance, various solutions can be evaluated in terms of achievement of objectives. The OR team does not attempt to tell management what the objectives should be or how the enterprise should function; rather, it helps to identify all of the objectives and clarify them.

When the foregoing steps have been completed, the problem can be formulated. Determining what the problem really is and expressing it are among the most difficult steps in operations research. Often, an OR study does not answer the specific question raised by management because the preliminary study shows that the root of the problem is elsewhere.

For example, the problem may appear to be: how to schedule production to minimize labor time. The real heart of the problem, however, may be: what inventory policies can be developed to give the most economical balance between chances of obsolescence and stock-outs within the limitation of available funds. Problems presented by management should be restated to take into account actual objectives and company capabilities that were not previously recognized.

After the problems are understood, relationships between the controllable factors of the situation and the objectives to be satisfied should be expressed. These relationships, which are quantitative, usually take the form of mathematical equations and are termed the model. They represent the real situation but are idealized and usually simplified. In designing the model, specific knowledge of functional rela-



Conflicts in objectives must be weighted to obtain the best solution for the business enterprise.

tionships among the variables is necessary. For example, it is necessary to know alternative manufacturing routings, production that can be achieved by each and costs associated with each.

The next step is to collect data and introduce it into the model. The tentative model shows what data are relevant. From the model, it is possible to determine the accuracy required in any data. In this way, extra work is avoided. The model is studied and manipulated until a solution is obtained. A set of values is obtained for the controllable factors that most nearly satisfies all of the objectives.

Results can frequently be tested to take account of factors that could not be explicitly included in the model. This can be done by considering a fictitious past performance of the enterprise in terms of the new policies. The risks, if any, connected with the new procedures should be clearly understood. Determination of the risks should be an integral part of the solution. The model is revised as necessary to make it as realistic and reliable as the situation warrants. The final step in any OR program is to determine how to implement the new policies.

Results of OR studies are usually applicable only temporarily for several reasons. Cost figures, product mixes and other data may change or new factors may arise. Where possible, OR models should permit simple inclusion of such new data.

An outside OR team is usually more effective if several company employees are included. Company men can continually add their experience in and knowledge of the company. They can follow through on the study when the team completes its job. Company men can also promote cooperation between the team and other company personnel.

Even if the team comprises only company personnel, some orientation time is required initially. Reorientation is necessary each time a significant change occurs in operations. Where a team is composed entirely of company personnel, these individuals should be relieved of all responsibility of company operation. They must be able to view operations with complete detachment and necessary data must be made available to them.

**Production Scheduling:** A problem of production scheduling for a machine shop can illustrate the generalities previously discussed. To clearly show the basic ideas involved, the example is simple and will be approached from a somewhat restricted viewpoint.

This machine shop produces torch tips for use in acetylene gas welding and cutting. These tips are



Company members of OR team must be relieved of daily operations so they can view problems with complete detachment.

made in large quantities and require several machining operations during manufacture. Most of them are made from bar stock that must be turned, cut off, drilled, swaged, milled and polished before final inspection. Some of the machining operations can be performed in any of several production centers, as indicated in the accompanying block diagram.

For example, the first two operations can be performed on either automatic screw machines or hand turret lathes. Because unit costs and times for producing the tips are different on the various machines, there is a problem of specifying the machines to be used for each week's orders. Such scheduling is done by the production scheduling department and represents the actual problem.

One might expect offhand that the machine that can perform the turning operation on tip No. 1 at the lowest cost, compared with all other machines, should be used to produce that tip. Turning and cutoff are cheapest on multiple-spindle automatic screw machines for the large production volumes of this shop. Automatics, however, may not really be the best choice for tip No. 1 when all other orders are also considered. If it costs three times as much to make tip No 2 on turret lathes as on automatics and if there is insufficient available production time on automatics to run both jobs, then perhaps the automatics should be used in production of tip No. 2. This would be especially true if tip No. 1 could be turned on the hand turret lathes with only a slight increase in production costs.

For only a few products and a few alternative ways of producing them, the best assignments of jobs to machines could be found by trial and error. Where there are a great many products and alternative machines, the problem is so complicated that trial and error will not give the best solution and may not even come close to it. Furthermore, by

trial and error, proposed solutions cannot be properly evaluated. To meet particular objectives, more complicated solutions are required.

From discussions with the people involved, the major objectives are revealed to be: (a) maximize short-term profits; (b) avoid expanding facilities, work force and shifts; (c) maintain product quality; and (d) make deliveries on time. The best solution to meet one objective may not be best for others. For example, (a) does not always go handin-hand with (c), The objectives should be weighted in terms of relative importance and combined into a single criterion by which solutions may be evaluated.

If, in this example, all production is for specific orders, prices and total quantities of the two types of tips are fixed as far as the production department is concerned. The major controllable variables of this problem are the routes and machines to be used for each batch of output; these, in turn, determine the cost. The objective of maximizing short-term profit is achieved by minimizing production cost.

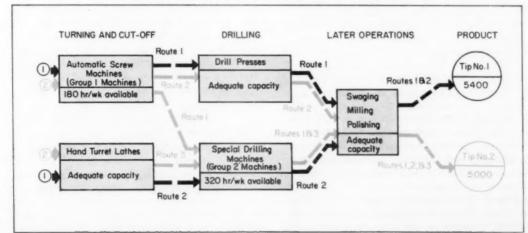
Quality of the product is safeguarded by admitting to consideration only the routings that produce a product of suitable quality. Routings that do not permit meeting delivery dates are excluded. Also excluded are routes that are subsequently found to present problems of sequencing orders on the machines.

This problem can be simply stated as:

Determine the number of each type of tip to be produced by each routing so that the total production cost is minimum, and delivery time and requirements are satisfied using existing facilities.

A model must be developed that includes all of the important factors of the situation and shows their interrelationships. In setting up the model, an algebraic equation can be written expressing the

Several of the routes by which torch tips can be manufactured.





Careful, scientific study of production problems by OR teams obviates the use of a crystal ball.

total cost of producing all the orders. Restrictions imposed by available machine time and required output can be similarly expressed. When these have been determined, simplifying assumptions can be applied. The most economical production plan can be derived from these equations by a technique called "linear programming."

The cost of each production operation is the sum of the unit costs times the number of units. Setup time will be considered later. Total relevant production cost, which is to be minimized, is the sum of all the costs for all the operations on all the orders. Algebraically, this statement is: Minimize

$$C = c_{11}N_{11} + c_{12}N_{12} + c_{21}N_{21} + c_{22}N_{22} + c_{23}N_{23}$$
 where

C = Total cost

 $c_{11} =$  Unit cost for tip No. 1 by Route 1

 $N_{11}$  = Quality of tip No. 1 to be made by Route 1

Solution of this equation results in a set of N values indicating how many of each tip should be made by each route. However, it is known that the objective of minimum cost is limited by available machine time and quantities of each tip required. Available machine time is restricted only on automatic screw machines (Group 1 machines) and special drilling machines (Group 2 machines). Machines with adequate capacity do not cause restrictions and

need not be considered. The restrictions can be written as:

$$\begin{split} t_{111}N_{11} + t_{211}N_{21} + t_{221}N_{22} & \leq T_1 \\ t_{122}N_{12} + t_{212}N_{21} + t_{232}N_{23} & \leq T_2 \\ N_{11} + N_{12} & = Q_1 \\ N_{21} + N_{22} + N_{23} & = Q_2 \end{split}$$

where

 $T_1 = Maximum$  available time on Group 1 machines

 $t_{111} =$ Unit production time on tip No. 1 on Route 1 on Group 1 machines

Q1 = Total quantity of tip No. 1 required

It is possible that the simplified model described by the equations will yield a routing plan that precludes meeting some of the delivery dates. As an expedient, the problem can be solved to find the most economical set of routings without regard to delivery dates. The solution can then be modified to meet delivery dates by considering the order of scheduling the jobs for each machine. Setup time is taken into account during this modification. Adjustments are made through use of the same mathematical relationships used to obtain the initial solution.

Models such as this one can be solved with a fairly recent mathematical technique called linear programming. This method frequently results in reduction of direct costs and savings in scheduling time. With linear programming, the production planner can proceed systematically to the best machine assignments by following simple rules and making simple calculations. The result is a set of N values that gives the lowest total production cost without violating the restrictions.

During preparation of the model, necessary production data should be collected. With sufficient data, numerical values can be substituted in all the algebraic expressions with the exception of the N terms. Sampling methods can be used in determining values in order to conserve time and cost while assuring required accuracy. The following data are necessary: a list of the alternative routings by which each product may be produced with satisfactory quality, unit time and unit cost for each machining operation in each routing, total available time per machine group, and setup time for each operation and machine.

When introduced into the model, the data form expressions as follows:

$$\begin{split} C &= (1.20) N_{11} + (1.65) N_{12} + (1.40) N_{21} + (1.50) N_{22} \\ &+ (1.75) \ N_{23} \\ (0.013) N_{11} + (0.025) N_{21} + (0.023) N_{22} \leq 180 \\ (0.028) N_{12} + (0.040) N_{21} + (0.037) N_{23} \leq 320 \\ N_{11} + N_{12} = 5400 \\ N_{21} + N_{22} + N_{23} = 5000 \end{split}$$



Sequencing problems frequently break down into questions of which job should be handled first.

When the model is solved by linear programming, although this simple model could have been solved without such a formal technique, it is found that  $N_{11} = 5400$ ,  $N_{21} = 4320$  and  $N_{23} = 680$ . Production costs associated with this plan are \$13,718 and, since only 178.2 hours of Group 1 machine time and 197.9 hours of Group 2 machine time are required, all restrictions are satisfied. Ample machine time is available for setup. If more hours were available on Group 1 machines, all type No. 2 tips would be made by Route 1 and total production cost would be only \$13,480.

Because 680 represents a short run that might not justify setting up the machines for Route 2, tip No. 2, this run can be eliminated. By linear programming, it can be determined that the best solution would then be:  $N_{11}=4125,\,N_{12}=1275$  and  $N_{21}=5000$ . Cost of this plan would be \$14,054. Setup time and delivery date requirements must subsequently be taken into account to obtain a final solution. In particular, the order of making the parts on each machine must be worked out so that there are no problems such as trying to run two parts on the same machine at the same time.

The necessary systems and procedures should be put into effect in such a way that clerical personnel can perform the planning operation each week. There should also be provisions for feedback of information to the scheduling group so that adjustments can be made for unforeseen events.

The mathematical approach is not a panacea for developing a model. In the case of production scheduling, for example, no mathematical technique that will handle all aspects of the problem simultaneously has yet been discovered. Even so, a mathematical method of suboptimizing a limited

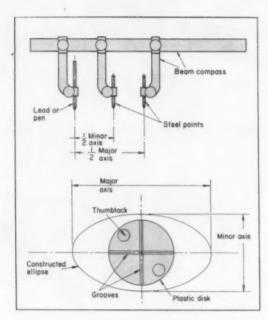


Average cost of a machining operation may be determined from a 20 percent sample to reduce the cost of data collection. Statistical methods can be used to show the probable error introduced by the sampling method.

problem is desirable for several reasons as long as such a solution is not regarded as comprehensive. Effects of alternative plans can be clearly seen and evaluated, and bottlenecks can be identified. Furthermore, since mathematical techniques can be set up for systematic handling, experienced personnel can devote full time to fundamental policy problems.

Problems of policy are related to the study of objectives. While income to employees and owners is a prime motivation, current, short-term and long-term profits must be evaluated separately, along with such objectives as retaining technological leadership. Such questions require the judgment of personnel from diverse parts of the organization. Occasionally, incompatibility between purely departmental objectives and plant-wide objectives is clearly revealed. Such conflicts, which are basic in the concept of industrial organization, are disclosed for analysis in the course of OR studies because of the fundamental and comprehensive character of scientific methods.

The Tool Engineer In His Daily Work



#### Ellipsograph

Construction of ellipses by draftsmen and designers is simplified through the use of an easily constructed ellipsograph. The elements of the device are a beam compass with an extra leg and a plastic disk on which perpendicular grooves have been scribed. In operation the beam compass is set as shown in the illustration. The plastic disk is placed so the scribed lines fall along the major and minor axes of the ellipse and is held in place with thumbtacks. The major and the minor axis points of the beam compass are placed in the grooves. Tracking both points along the grooves causes the pen to trace an elliptical path around the center line.

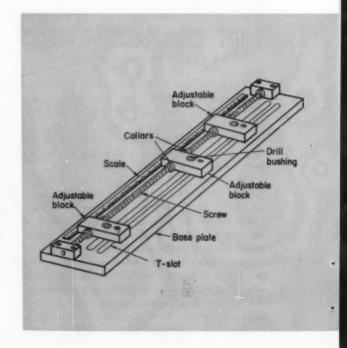
William Borowski Chicago, Ill.

#### Adjustable Drill Jig

Under job shop conditions, it was necessary to make up a variety of gage bars from ½ x 1-inch stock in lengths up to seven feet. As many as ten holes were drilled along the center line with different hole spacings on each bar. The simple adjustable jig shown expedites the drilling operation and insures that the holes are accurately located.

The jig consists of a base plate on which a long screw is mounted. Individual blocks containing drill bushings slide freely along this screw. In setting up the jig, the blocks are located to the nearest 0.001 inch through the use of a scale on the base plate. Graduated threaded collars on each side of the blocks provide for precise adjustment. Ends of the blocks are screwed into T-nuts which are held in a T-slot milled in the base plate. The edge of the bar to be drilled is located against dowel pins on the lower surface of the base plate.

Ernest Jones New York, N. Y.

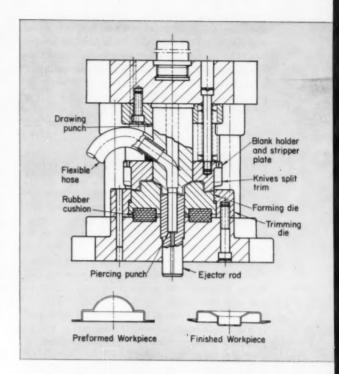


#### Combination Die

Drawing, piercing and trimming operations are combined on this unusual die used in the manufacture of centers for small disk wheels. The workpiece is partially drawn in a previous operation to the semispherical shape shown in the accompanying drawings. The combination die illustrated produces the finished shape, trims the edges of the part, cuts the trim into two pieces and punches a hole in the center of the part in one operation.

The lower half of the forming die is mounted on a rubber cushion. As the punch descends, the part is formed and the cushion is compressed. This brings the trimming die into operation. Two knives split the trim. When the drawing punch approaches the bottom of the stroke a piercing punch fastened to an ejector rod goes into action. Scrap from the piercing operation is forced through a hole in the drawing punch. A bent pipe and flexible rubber hose carries this scrap to a box. Scrap from the trim operation is removed by air.

Hjalmar Dahl Upplands Vasby, Sweden

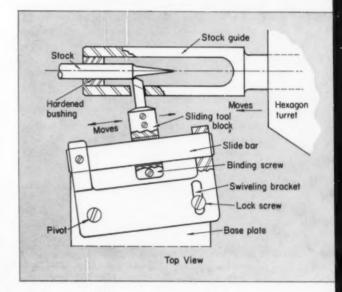


#### **Turret Lathe Taper Tool**

Machining long tapers on small diameter stock is always a problem. The illustrated turret lathe jig gives good results on production work of this sort. Essential elements of the tool consist of a base plate, swivelling bracket, slide bar, tool block and stock guide. The assembly, with the exception of the stock guide, is mounted on the cross slide of the lathe.

The stock guide is fitted to one of the tooling holes in the hexagon turret. This guide is equipped with a hardened and ground steel bushing to fit the diameter of the bar stock being machined. The stock guide has an opening machined through the top and bottom for chip removal and to admit coolant. The opening will also permit viewing the cutting action of the tool bit. On the front side of the stock guide an opening is machined to admit the cutting tool and support it in position so that its cutting edge is on dead center of the lathe.

In operation the swivel bracket is set and locked at the correct angle for the taper desired. Stock is pushed through the guide and the tool is fed by the cross slide feed to the proper depth of cut. The hexagon turret feed is then engaged and, as the stock guide moves toward the headstock, it carries the cutting tool with it. The tool block



slides, at the preset taper, along the slide bar. Thus, this taper is generated on the work. The tool block has been slotted to allow it to be adjusted for a snug fit on the slide bar. This slide bar is lubricated through an oil cup on the top surface of the tool block.

If other operations are required on the workpiece it may be necessary to retract the cross slide and allow the cutting tool block to drop into down position. The turret can then be indexed to present box tools, die head or other tools to the work. This attachment will not impede the proper operation of a cutoff tool in the rear tool block position when the tool bit is removed from the positioning slot and allowed to drop out of the way.

It is suggested that the slide be hardened and

ground and that the tool block be provided with a bronze bushing which is split after assembly in block. The fit of the tool block on the slide can then be adjusted by the binding screw.

> H. J. Gerber Member-at-Large Stillwater, Okla.

#### Differential Expanding Mandrel

When hollow castings having stepped bores are machined on the exterior, it is often essential that the wall thickness be maintained fairly constant. One way of locating the casting internally is by using the type of mandrel illustrated. Two locating members contact the interior walls of the casting. They operate independently of one another and adjust themselves automatically to size variations and steps in the bore.

The mandrel body is comprised of a solid steel cylinder with recesses bored in each end to accommodate expansion cones. Each cone is threaded over about half its parallel length for engagement with a corresponding internal thread in the mandrel recess. A cylindrical guide portion on each cone insures positive radial location. The cones are case-hardened and their outer ends are center drilled for mounting between lathe centers. Flats are machined on the projecting ends for engaging with a wrench.

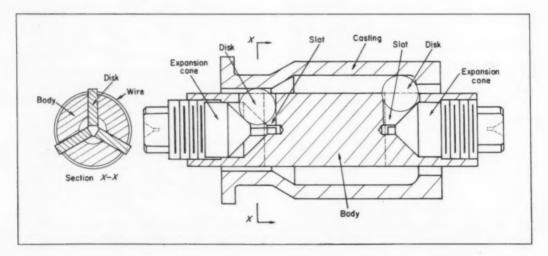
Three hardened steel disks form the expanding members which engage the interior walls of the component. The disks slide without clearance in radial slots machined in the mandrel body. They are pushed outward by the expansion cones. The disks are prevented from falling out of the slots, when the mandrel is unloaded, by a ring of spring wire which passes through a small hole drilled through each disk.

Disk-shaped locators have the advantages of ease in manufacture. Even in the maximum expansion position, they are adequately supported by the mandrel body. The grip of the disks on the work surface is sufficient that there is no danger of the work slipping under heavy turning cuts.

In use, the lathe driving dog is attached to the left-hand expansion cone. The rotary driving action will tend to tighten the cone and force out the locating members so that they press firmly on the interior walls of the castings. The drag of the tailstock center on the right-hand expansion cone has similar tightening effect.

Since the gripping members expand independently of one another, they adapt themselves readily to plain cylindrical bores. When gripping such work, there is tendency for heavy cutting pressure to slide the work axially. This effect can be minimized by providing some positive form of abutment for the component. This might be a sleeve slipped over the mandrel and bearing at its left-hand end on the driving dog.

C. T. Bower London, Eng.



# dip brazing boosts output

of aluminum assemblies

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D IP BRAZING HAS progressed from a small specialized operation to a mass production method at Martin which has increased output of dip-brazed assemblies by 200 percent in the last 18 months. Advent of the guided missile with complex electronic systems gave rise to the need for a new process of fabricating wave guide components. Close tolerances required for such parts obviated the use of fusion welding; it was at this point that dip brazing was installed as a production process.

The quality of the braze and the high rate of production secured were so gratifying that it was decided to attempt to dip braze secondary aircraft structures, Fig. 1. Previously, these aircraft parts had been welded by hand. Since the welder had to run a bead down each joint, it was a slow operation. There was always the problem of deformation of



Fig. 1. Dip brazing operation utilizing fixtures to hold parts during the process.

the welding fixtures from the localized heating. Dip brazing eliminated these problems. For example, an assembly with four joints is placed in a fixture and the entire mass is heated uniformly to a temperature nearly equalling the flux bath.

The fixture containing the assembly is dipped in the flux bath and the four joints are brazed simultaneously in a matter of from one to three minutes.

<sup>\*</sup>Senior member ASTE Baltimore chapter.



Fig. 2. (left) Parts being assembled with the brazing material prior to the dip brazing operation.

Fig. 3. (below) Assembled parts grouped on fixture for the brazing operation.

The fixture shows no deformation because it is heated uniformly. Not only is it possible to braze assemblies with multiple joints but multiple assemblies can be dipped together providing they are not too large. Quality and quantity are increased at the same time.

#### How the Process Works

Dip brazing differs from welding in that a filler material, with a lower melting point than the material to be brazed, forms the joint without melting the parent material. In production operations the brazing procedure which has been developed consists of six distinct steps as follows:

- Deburring
- · Cleaning
- · Assembly
- Preheating
- Dip brazingFlux removal

Since the brazed joint is made by filler material flowing into the joint as a result of capillary action or gravity, burns are removed because they could restrict the flow and cause an imperfect union.

Parts are cleaned in a trichlorethylene vapor degreaser and a 45-second dip into a detergent type cleaner. This is followed by a rinse in cold running water and a 45-second dip in a 50 percent solution of nitric acid. Next, the parts are given a one-minute dip in an oxide removing solution, then go into a hot-water rinse and finally are dried by air blast.

During the assembly of the parts, the filler material is shaped to fit the joints, Fig. 2. The as-



sembled details are then placed in the brazing fixture with the filler materials in place, Fig. 3. The details can be held in position by tack welding, Fig. 4, spring-loaded fixtures, spring clamps, staking, self-locking joints and spot welding.

For preheating, the brazing fixture containing the assembly is placed in the preheat oven, Fig. 5, where the temperature is maintained at 1000 F  $_{\pm}$  5 deg Fahr. The preheating operation serves a dual purpose. First it drives off all moisture from the assembly and fixture, thereby removing any possibility of an explosion, which might occur if water were

introduced into the molten flux. Secondly, it also helps prevent reduction of the heat-head of the flux bath.

When assembly and fixture have reached 1000 F they are removed from the preheat furnace and immersed in the dip pot. Immersion time varies from one to three minutes depending upon the mass of the assembly. If assemblies are permitted to remain in the flux longer than three minutes, strength values will be substantially lowered, due to gradual transformation of the parent material from the "as wrought" condition to the "as cast" of the joint at the brazed interfaces. Assemblies removed from the pot are in the SO condition and must be heat treated to obtain maximum strength values.

Next, the assembly is allowed to cool and then immersed in hot running water to remove the frozen salt cocoon, Fig. 6. The part is taken from the fixture and given a one to two-minute dip in a 10 percent solution of sulfuric acid to neutralize any remaining flux. From this it goes to a cold-water rinse and then into a brightening bath of 10 percent nitric and ½ percent hydrofluoric acid for three to five minutes to complete the flux removal process.

#### **Design of Parts**

Design of details plays an important part in dip brazing. Proper joint design and self-locating parts permit lower fixture costs and in many instances the elimination of fixtures. Self-locating parts make it possible to tack weld details on the assembly, Fig. 4, and achieve an acceptable braze by using a base plate to support the assembly during preheat and dipping operations. Details to be dip brazed can be manufactured to standard shop tolerances in most instances. When designing wave guides and other electronic assemblies requiring extremely close tolerance, however, plus or minus 0.002 inch is the accepted standard.

Filler material commonly used is FS-RAL 718, which is 88 percent aluminum and 12 percent silicon. It has a melting point of 1070 F and a flow point of 1080 F. This filler is obtained for use in strip form, Fig. 2, of 0.003 to 0.020-inch thickness or in wire form 1/16 to ½ inch in diameter.

#### **Equipment Used**

The major dip-brazing equipment employed consists of the following items. An electrically heated circulating air furnace which can maintain 1200 F temperatures is important for the preheat operation. The furnace in use is  $18 \times 18 \times 18$  inches in size which is satisfactory for the size of assemblies currently being handled.

The Ajax-Holtgren pot is ceramic lined with a steel shroud around the outside. It is heated electrically by two pairs of submerged nickel electrodes. Nickel is use primarily because it resists the corrosive action of the flux better than other materials. A hood containing a fume separator is mounted over the pot to remove the chloride and fluoride fumes which are extremenly irritating and highly corrosive. These fumes are most noticeable when the pot is first started or when flux is being added. For this reason, necessary flux additions are made at the end of the day.

The pot is capable of operating at a temperature of 1200 F, but for aluminum dip brazing employ-



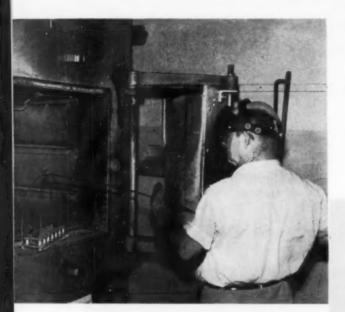
Fig. 4. When design permits, parts can be tack welded, eliminating the need for a brazing fixture.

ing Alcoa No. 34 flux, it is never operated over 1100 F. The pot holds approximately 1200 lb of granular flux.

Four stainless steel tanks, one for nitric acid, one for caustic and one each for hot and cold water are used for removing flux after brazing. In addition there are a number of miscellaneous items of hand tools and equipment required including potentiometers, recording instruments, aluminum alloy coils for dehydrating salt baths, stainless holding racks, etc.

#### **Maintenance Requirements**

Before use, the empty pot is preheated by a gasfired torch to a temperature of 950-1000 F. This accomplishes two things. It drives out any moisture,



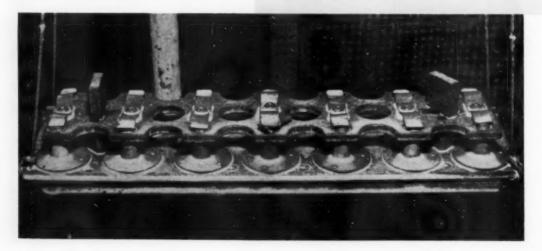
and eliminates hot and cold spots, thereby preventing flux from freezing to the sides of the pot. Once the preheat temperature is attained, granular flux is added and melted with the torch. Care is taken to prevent overheating flux or electrodes. When the flux begins to melt, the furnace transformer is turned to its highest tap and the torch removed. Since this melting period is critical, close supervision must be maintained to prevent the flux from becoming too hot and fuming excessively.

When the flux becomes molten the temperature is raised to 1175 F for a period no longer than two hours. This high temperature increases fluidity of the flux to allow it to penetrate the smallest opening. A steel shield on the outside of the pot is finished with a silver paint. If the flux should penetrate the ceramic liner and contact the steel shield, the silver will turn brown. A blast of air directed on the brown spot will cause the flux to freeze and form an effective seal.

Flux is dehydrated after thee pot is sealed. This is accomplished by immersing preheated coils of 2S aluminum into the flux for a period of 15 to 30 minutes. This is repeated using fresh coils until the aluminum finally emerges clean. The dehydrating process, in addition to eliminating all moisture, removes any foreign matter from the flux. The coils are cleaned for future use by a hot water rinse followed by a ten-minute immersion in a 10 percent sulfuric acid solution.

Fig. 5. (left) Preheat furnace used to bring the parts assembly up to temperature before brazing.

Fig. 6. (below) Fixture and parts immediately upon removal from dip pot, showing encrustation of flux.



Efficiency of equipment and quality of braze depend upon proper maintenance. Twice a week the dip pot is sounded for salt depth and the sludge is removed. The flux is analyzed weekly by quality control laboratory to detrmine chloride and content. The flux is then adjusted according to the analysis. When the content of either ingredient is low, poor brazing, freezing of the pot, porosity in the fillets and pitting may occur.

Control of the temperature of the pot is secured by a Leeds-Northrup recorder to which thermocouples in the pot are attached. By this means, the temperature is regulated within 2 F. This equipment is inspected monthly. Inspection entails use of a pair of thermocouples which are calibrated and then attached to a potentiometer. Readings on the potentiometer from 36 different spots in the pot, are checked against the recorder and necessary adjustments are made. As an added precaution a limit switch is used to cut off power in the event the thermocouple shorts out, thereby eliminating danger of overheating the flux.

Typically, dip brazing pots are troubled with flux solidifying around sides and top. This is removed daily; otherwise it would gradually reduce the size and efficiency of the pot.

In event of a power failure of more than 45 minutes, the pot is ladled out until the molten flux is below the top of the electrodes. Unless this is done, the pot will freeze and use of chipping hammers will be necessary to remove solid flux. This might necessitate complete relining of the pot.

#### **Tooling for the Process**

Two major factors must be considered in tooling for dip brazing. These are design and material. Tools must be designed specifically for the process. Provisions for rapid flux drainage are a primary consideration. This brings about a substantial saving by reducing the amount of flux drag-out, shortening the flux removal soak time and aids materially in removal of the brazed assembly from the fixture. Use of screws or bolts is avoided since threads become filled with molten flux which freezes and can be removed only after soaking for long periods in boiling water.

Experience has shown that hooked springs with locking bars, Fig. 7, keyhole slotted springs and similar holding devices are best for quick, easy removal. Such springs should not bear directly on the assembled parts unless contact is over an area large enough to prevent marking or indenting the part. A stainless-steel shim inserted between spring and part eliminates this problem.

Adequate bracing of the fixture base is necessary to avoid warpage during heating and cooling operations. Standing legs welded to the base have proved satisfactory. Lightening holes are drilled in the

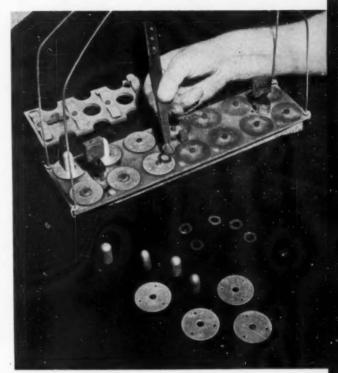


Fig. 7. Typical fixture for small parts utilizing spring loading principle.

fixture base and standing legs whenever practicable. This reduces mass of the fixture and substantially cuts preheating time. Consideration must be given to thermal expansion differences of assembly and fixture, and allowances should be made accordingly. Spring loaded fixtures which allow parts room to expand have proved most satisfactory.

Fixtures used in dip brazing are fabricated of Inconel,  $301-\frac{1}{2}H$  stainless steel or equivalent. Tests show that 1025, 4130 and similar steels are subject to attack by the flux. They scale excessively and contaminate the flux.

Music wire is acceptable as coil spring material. Inconel -X however, is needed for flat springs. Stainless steel 301-½H can be substituted but has a substantially shorter service life.

Dip brazing, as performed by Martin, has contributed substantial savings in labor and material. In its present stage of development, it can be used only for secondary structures and commercial designs, due to inherent strength limitations. Progress has been made, however, in the relatively short time the process has been used. This gives reason to believe that further experimentation will lead to the development of stronger filler materials allowing primary structures also to be dip brazed.



Resinized coated abrasive belt, powered by a lathe, is used to remove weld spots from automobile bumper guards.

Improvements in and advantages of coated abrasive belts have led to development of a new array of metalworking machine tools. Production engineers have been quick to apply these tools, often in ways undreamed of a few short years ago. Development has been so rapid that a survey of these machines and their significance for metalworking is timely.

Performance and usefulness of the coated abrasive belt were extremely limited until a few years ago. Today, machine tools based on coated abrasive belts are doing some jobs that may be described as spectacular: stock removal can be measured in ounces per pass, high-quality surface finish is normal, tolerances can be held to 0.0002 inch and ink can be ground from a printed sheet of paper.

As a result, cool-running, low-cost belts have become a recognized production tool, not only for stock removal and surface finishing but for work for-

# the ABRASIVE BELT and its use in machine tools

By J. K. McLaughlin

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merly requiring milling, surface broaching, shaping, planing and filing. An impressive variety of machine tools has been designed to bring the abrasive in contact with the workpiece. The five basic methods are: on a contact wheel, as a free belt, over a platen, on a drum or in rolls. Tools and components made up of these elements are classified in the accompanying chart. Indicated applications are either typical or specific.

Simple and familiar, yet varied in form and versatile in performance, the backstand idler has served as the prototype for many of these machine tools. Basically, the backstand machine comprises a drive pulley and a wheel supporting an endless coated abrasive belt, frequently with one or more auxiliary idler pulleys.

Work may be applied to the belt at the contact wheel with wide variation in metal removal rates. Removal rates are governed by type of abrasive, grit size, hardness and pattern of wheel, belt speed, angle at which work is presented to belt, direction of belt travel with respect to work and type of lubricant used. Contact wheels are made of hard metal, to provide line contact; rubber, in a wide range of hardnesses and surface patterns; compressed canvas or softer cloth; wood or plastics. Cogged or serrated contact wheels provide high stock removal rates, and flat faced or formed wheels permit offhand grinding and polishing of curved or contoured parts.

For greater production speed and consistency, parts can be brought to the contact wheel in semiautomatic indexing fixtures. In its most productive form, contact wheels are used in multiples around the perimeter of rotating tables. Successive wheels or heads move into engagement with the work as it passes on a conveyor belt or fixturing-bearing chain.

Work does not necessarily need to be applied to the belt at the contact wheel. It may be strapped against the unsupported belt or against a belt made firmer by a parallel backup belt of leather, rubber or canvas. When machining is done in this manner, which forces the backup belt to conform to the workpiece shape, a guide pulley is required to keep the backup belt tracking properly.

Work may be applied against a section of belt supported by a hard, flat platen or a pair of rollers. The latter arrangement is useful when grinding radii on edges, for example. Platen grinding generally involves moderate or light cuts. For economical production, stock removal rarely exceeds  $\frac{1}{32}$  to  $\frac{1}{16}$  inch on ferrous or double these limits on nonferrous materials. Platen grinders permit semiautomatic operations with pressure, depth of cut and rate of feed all constant.

There are many variations of the wheel-and-idler theme. The yoke sander, for example, has a narrow

#### Classification of Abrasive Belt Machine Tools

Type of Tool	Basic Design	Application	Type of Tool	Basic Design	Application
Grinding and polishing lethe	Contact wheel	Offhand granding and finishing	Semiautematic work holder Perts to a polished	Contact wheel	Used with polishing lathe
Cog-tooth contact wheel	£0	Stock removal by offhand grinding	Small rotary R n n	Contact wheel	Continuous or inter
Smooth-faced rubber or compressed carva wheel	1 0 1	Polishing flat areas	work holder	Floor	mittent motion
Bias-cut cloth wheel		Finishing bumper guards	Double-belt grinder	C/A bults Workpace	Grinding both side of workpieces
Formed or contour wheel	1	Contour polishing	V		or workpaces
Steel contact wheel	Steel contact wheel	Fine finishing carbide tools and heavy stock removal on steel ports	Belt grinder with pinch-roll feed	Conflact re	set
Small contact wheel	Dearing quil	Concave areas of parts		Bildy reft	
Spring-tension contact wheel	THE STATE OF THE S	Fillers of jet blodes	Belt grinder with top and bottom rolls	9 000	Sheet polishin meh rolls
Com control	Contact wheel Brise	Generation of irregular shapes	Reciprocating tuble grinder	Contract roll Sheet	Stock removal in exce of single-pass ability and tapering

belt running over a small wheel at the outer end of a tensioned, adjustable arm. Such machines are used for grinding and polishing difficult inside or outside contours. Tongue sanders are usually bench mounted and have contact wheels of such small diameters that the belt can reach inside surfaces that would otherwise be finished only with difficulty.

Swing-frame grinders, based on the same general principles, are heavier machines pivoted at one end and equipped with handles for manual control. Swing-frame grinders are used to machine curved or irregular parts that are too large or unwieldy to lift against a belt. Many small swing machines are versatile as to the nature of workpiece they can machine and the range of production rates where they can be used economically. These units, hinged nearly midway between driving and driven pulleys, may be suspended above or beside a conveyor line; may be lathe mounted for light cylindrical grinding or may be mounted atop a floor stand. Stand-

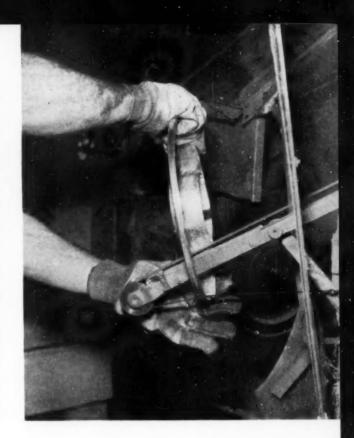
Type of Tool	Basic Design	Application	Type of Tool	Basic Design	Application
Magnetic chuck conveyor	Magnetic chu (Ywel poult	ch Thin steel parts	Reversing roll grinder		e passes without ig work from machine
Cleated hard rubber belt conveyor		Grinding and polishing small ports	Standard swing-frame grinder  Communications  Communications	000	rhead Plow perl moldboard grinding
Spenge or soft rubber conveyor	0 0	Parts sink into conveyor Nonferrous less and one held during granding parts		Work	_
Abrasive feed belt		Abraeve belt pron side up)  Heavy stock removal	Swing-frame grinder Custon with support wheel	Suppor	Weld removal on ship decks, etc.
Teolroom surface grinder (undeveloped)	Collection Werker	Flot work	Wet grinding swing frame (undeveloped)		reded for hard-te-grind stells of large size
Abrasive control who conterless grinder	- /	Conventional centerless grinding	Free-belt roll grinder	CA NO	For finishing roll
Abrasive belt control centerless grinder	Contact wheel	Heavy stock removal, reversal of stock for multiple passes	Vertical belt grinder	Floor	Free-hand grinding a automobile windshield
Rubber feed roll centerless grinder	Adder control Work Control wheel	Light centerless grinding	Vertical grinder with roller backup	Planter   Plante	Finishing rounded edge
Strapping type center	Ope Ica	A belf		Prom	
less grinder with or without back-up belt	. 0	Fine finishing without lap marks	Vertical grinder with platen backup	0	Finishing square adgram work

Free area of coated abrasive belt is used to strap and polish tight contours of an automobile horn ring.

mounted models afford great freedom of part movement around the wheel head. A typical machine tool of this type uses a 1½-hp motor to drive a 2½ by 72-inch belt over a 6 by 2½-inch contact wheel.

Probably next in popularity is the simple lathe head on which grinding and polishing wheels are mounted directly. Such wheels are often soft enough to permit contour grinding. One type of head is made of a series of coated abrasive strips that grind or polish with a slapping action. Another wheel, made entirely of folded abrasive cloth except for a small steel hub, is not only long-lived but can hold any contour generated into its face for its entire life.

Large-area sheet and strip metal is now being ground and polished in high-production operations with batteries of vertical grinders that use abrasive belts up to 86 inches wide and more than 10 feet long. These tools remove surface defects and produce fine finishes, often to close tolerances. They can be used to grind and polish sheet, plate, bar, coil and blanked shapes. Depending on the types of workpieces to be handled, these machines are supplied with hydraulically powered reciprocating



Type of Tool	Basic Design	Application	Type of Tool	Basic Design	Application
Vertical grinder with double-roller backup	3	Finishing rounded edges	Small-loop grinder Foot in lension	Flonge Flonge Accident Finger Inde in scissors	Finger holes in scissors
Floor-stand polisher	Floor stand Prents on other	y make Polishing surfaces of revolution	Precision vertical platen grinder	Platen	Wet or dry grinding
Floor-stand polisher with backup belt	Backup belt	A beil Polishing surfaces of revolution	Oscillating work Oscillating work table platen grinder	Plater	Improved wet or dry finishing
Wrench grinder	Formed rolls	Removing parting lines on wrench forgings	Automatic drop feed vertical platen grinder	Drop chule for ports	Finishing washers o spacers
Leading and trailing	No so	Jet engine bludes	Conveyor feed-verti- col platen grinder	Conveyor Need (soulements)	High production of

tables or with power-driven pinch or feed rolls for straight-line work. They may also be equipped with reels to process coiled materials.

Other grinders, developed to operate on the principles of drum sanders used for woodworking, are available in widths from 12 to 80 inches. One such machine has two contact cylinders mounted on a single base to provide roughing and finishing cuts in a single pass. A machine for close-tolerance work has two finishing drums, separately powered and independently adjustable. A third motor drives the feed rolls. A billy roll, rotating in the direction of feed, supports sheet material while it is in contact with the polishing drum. This equipment can handle material in thicknesses from ½2 to 6 inches.

Another machine tool based on the vertical grinding principle is sometimes ganged in as many as 24 units to accomplish a complete finishing job with abrasive belts of successively finer grit. Equipment of this type can be readily set up for automatic operation with loaders and unloaders. Such polishing units commonly use dynamically balanced contact rolls and have automatic hydraulic, electric or pneumatic control for belt tracking. Oscillation rates can be varied and feed belts are raised or lowered hydraulically or pneumatically with final micrometer

adjustments made manually. Still other machine tools have the abrasive belt attached directly to a single cylinder that may oscillate or not. Such drums may be wound spirally or straight. In the latter type, ends of the abrasive material are secured tightly in a slightly angled transverse groove.

Work holding and conveying are often combined for the larger machines. Work may be held by magnetic chucks, located under the conveyor belt, or it may be moved into position on a cleated belt or gripped by being partly submerged in a sponge rubber surface on the conveyor belt.

One type of centerless wet-belt grinder uses a resilient contact wheel with a conventional regulating wheel. V-belts from a 3-hp motor provide a belt speed of 5000 sfpm. Through-feed speeds up to 35 fpm are available and tolerances of 0.001 inch can be held on small diameters. Maximum diameter reduction on steel is about 0.005 inch per pass at 2 fpm. Commonly used speeds are approximately 18 fpm for 1-inch aluminum and 7 fpm for light cuts on 1-inch steel. A 70-Durometer wheel is used for polishing and grinding operations, and an 85-Durometer wheel is used for precision work. Grits may range from 36 to 400 in silicon carbide or aluminum oxide.

Type of Tool	Basic Design	Application	Type of Tool	Basic Design	Application
Twin-belt vertical platen grinder	Plane	Mator keys	Moving-platen grinder	Mindse platen  Two platen  Work	Aluminum door finishing
Horizontal-platen grinder with nar- row belt	Prince	Plastic parts	Multiple-shoe twin-belt grinder		ine finishing without chandling workpieces
Horizontal-platen grinder with wide belt	Pales	Meter ceses	Roller-platen grinder		Heavy stock removal on steel panels
Horizontal serrated platen grinder		Heavy cutting on flat surfaces	Inflatable-platen Jude of grinder	Table C.A to	Polishing internal surfaces of tubing
Horizontal-platen grinder with auto- matic fixturing	CA NOT CONTROL STATE OF THE PROPERTY OF THE PR	Precision grinding of flat surfaces with con- trolled pressure	Horixontal-platen grinder (undereloped)	C/A bells Plates  Coden  Workpiece	Wet finishing with high workpiece pressure

Semiautomatic ferris wheel work holding fixture carries fountain pen barrels to a coated abrasive belt for polishing. Abrasive belt is backed by a preshaped contact wheel on this vertical polisher.

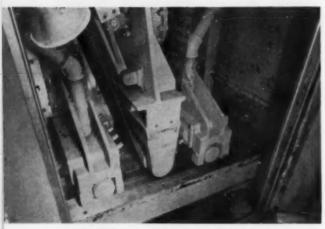
A machine with these general characteristics has put a bright finish on 1-inch aluminum tubing at 18 fpm and finished 2240 feet of tubing with a single 320-grit lubricated silicon-carbide belt. Rigged with a simple chute feed, it has finished the outside of aluminum fountain pen barrels at a rate of 2000 per hour. This pace was maintained throughout an 8-hour shift with a 400-grit silicon-carbide belt.

Heavy-duty centerless grinding tools handle outside diameters up to 9 inches and weights up to 300 pounds with traverse speeds up to 30 fpm. A typical machine, which traverses at 15 fpm, uses a coated abrasive belt running over a heavy steel contact wheel. With coolant flushing the belt, the machine provides rapid stock removal rates. An abrasive regulating belt is backed up by a rigid steel platen to give full-width belt contact with the workpiece, regardless of feed angle.

Contour grinding is adapted in an interesting fashion by a machine tool that polishes the inner surfaces of seamless or welded tubes from  $\frac{5}{8}$  to 9 inches in inside diameter up to 50 feet long. The belt is passed through the tube and made endless by joining the ends in a hot press. The abrasive is



Type of Tool	Basic Design	Application	Type of Tool	Basic Design	Application
Open-jawed cylinder grinder	C/A control	Surfacing fiber pieces	Longitudinal C/A polisher	age blog	be Jet blade finishing
Spiral-wound cyl- inder grinder	C/A cover	Close-tolerance finishing of mica and thin steel	Crankshaft Sapper	Cronkels Holder	Fine finishing of crankshaft bearings
Cylindrical grinder with pinch-roll feed	Drum with C/l		Micro-finishing machine C/A	Pres	Fine finishing of flat metal parts
Cylindrical grinder with conveyor feed (undeveloped)	Drum with C/A co Coolont fulle Worksteen Pressure ruli Conveyer bei	Autometic operations	Drag-wipe machine	Find then	Sheet polishing
Fined Roll grinder	Reli of C/A Cranishoft journ	of Finishing automobile crankshafts	Fixed (straight or formed) steel nosepiece machine	C.O. ball on-robating on-robating	Contour grinding



A permanent magnetic chuck holds the small drilled stampings as they are carried to the coated abrasive belt for deburring and sizing. In operation, a liquid coolant is used on the waterproof belt.



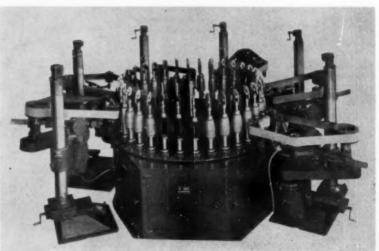
Operator spirally winds coated abrasive on a precision grinder used for accurate finishing of rigid sheets. Cylinder may or may not oscillate.

Multiple-station continuous rotary automatic machine has a 32spindle table and six polishing belt lathes for finishing of entire workpiece. skived from one to reduce joint thickness and the joining operation takes about two minutes. The belt passes around a pulley on a driving motor at one end of the machine and around an idler, equipped with a tensioning device, at the other end of the machine.

Grinding pressure is applied by an expanding head attached to a traveling ram. Compressed air is pumped through the ram and into the head, forcing the latter against the belt. The power-driven ram drives the expanded head back and forth through the tube, which is supported and rotated by rubber-faced rolls. The tube can be revolved at any of three speeds and the ram can be traversed at any of four speeds. The tube is cooled by a water spray.

Advances toward increasing utility of coated abrasive belts are being made in several directions. Machine tool builders are seriously considering abrasive belts for today's designs and tomorrow's plans. Tool engineers are broadening the usefulness of existing abrasive belt machine tools through development of unusual work-holding and work-handling fixtures. Also, belt quality and contact-wheel designs are being steadily improved.

Nevertheless, gaps still remain. Yet to be developed is a precision toolroom surface grinder. Such a machine should be successful because of the inherent cool-running of the belt and the possibility of precise control over great widths. Also of value would be fixturing for use with horizontal platen grinders that could be used wet or dry. Automatic stroke grinders can become more useful if higher pressures can be applied to the moving platen, and drum grinders will become more efficient if they can be designed for wet operation. Men who have worked closest to the development of abrasive belt machine tools feel that the surface of this field has just been scratched.



# gear gaging goes

### AUTOMATIC

By T. S. Gates\* Chief Eng. National Broach & Machine Co. Detroit, Mich.

Automatic, in-process inspection is one of the accepted fundamentals of automated metal-working production lines. By applying this principle to gears the quality is increased while cost can be substantially decreased. This article cites examples as to how this is being accomplished.

IN-PROCESS CONTROL of metalworking machine tools based on automatic inspection devices is a key to the success of automated production lines. Whether these controls shut down the machine after a certain number of rejects have been made, sort out rejects by type or actually adjust machine settings based on measurement trends, is a matter of refinement. Automatic gear gages now in operation continually check gears for size, eccentricity, helix angle, full-tooth and tooth thickness in various combinations as required. The gages can be installed in a production line Fig. 1, or can be hand loaded to make inspection checks on lower production operations. Another method of checking gears is with testers with electronic sound-discriminating devices which reject noisy gears. In-process inspection of gears produced on automated production lines has been one of the more difficult problems faced recently by tool engineers.

#### Requirements of Automatic Gear Gages

Like all inspection devices, an automatic gear gage must be more precise than the machining op-

Abstracted from Paper 24T24, "Gear Gaging Automation," presented at the 24th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society Headquarters.

<sup>\*</sup>Senior member ASTE Detroit Chapter

eration it checks. It must provide the optimum in accuracy, repetition of readings and dependability of performance. It must give long, trouble-free operation, lest benefits of automation be lost in gage maintenance and subsequent line shutdown.

To meet these exacting requirements, automatic gages must have a minimum of moving parts. Bearings must be of maximum precision. Gages must

be compact and designed in such a manner that they can be placed near the machine whose output they are going to check. Suitable means of feeding parts through the gage must be provided as well as means for directing parts in and out of the gage. Best operation of automatic gaging devices is achieved by passing the gears through a compact washer ahead of the gage. Thus, the gears are free of chips, cutting fluid or contaminating material which could affect the operation of the gages.

Workmanship must be carried to a high degree in the manufacture and assembly of the gage. Users of automatic gear gages should recognize that this is the key to success of gear checkers and give them the care and treatment usually accorded precision instruments.

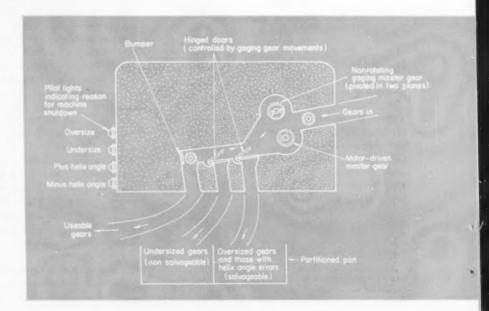
A gage that merely rejects parts and fails to clearly indicate the reason for rejection, is ineffective. Gaging operations within a gear gage must be done in sequence to enable signal lights to indicate reason for reject and what machine control is to be adjusted.

#### **Function of Automatic Gear Gages**

The newness of automated gear production concepts has demanded that composite type gages be developed first to meet the initial needs for inprocess inspection. One method of checking size of gears is by passing them between two master gears Fig. 2. One of these gears is motor driven and rotates while the other does not rotate. As the gear to be checked passes between the two master gears, the nonrotating gear is displaced to various center distance locations. The amount of displacement in

Fig. 1. (above) Automatic gear checker installed in a fully automated pinion production line, checks output from a rotary gear shaving machine.

Fig. 2. (right) Schematic arrangement of an automatic gear gage designed to check both size and helix angle errors.



the vertical plane determines the size variation of the gear being checked. This information is then relayed through a lever arm and numerous microswitches Fig. 3, and the gear is either OK'd or rejected. This master gear mounting can also be designed to pivot in the horizontal plane and thus simultaneously indicate helix angle accuracy. This is done through the lever arm and another set of microswitches. After checking, these gears are ejected through trap doors designed in the geargaging unit. Trap doors are controlled by solenoids and the parts are dropped in the proper chute according to the condition found. By design of the trap door controls and gaging sequences, rejects that can be salvaged can be separated from those that cannot.

#### **Basic Factors of Gear Gages**

One of the basic factors in applying in-process gages to automated gear production lines is that the machine is shut down only after a certain number of successive rejects are produced. It is uneconomical to shut down a machine every time a reject is produced. Initial setup might be in error and there would be no way of knowing unless several gears were checked. Stoppage of the machine is accomplished through relays. When a reject is passed through the trap door, it is registered on an automatic counter. When three successive rejects pass through, the machine is stopped. If, however, after one or two rejects, a usable gear is produced, the automatic counter is reset to 0 and the process is repeated until three successive rejects are produced. Percentage control of machine shutdown can be accomplished if so desired, by adjustment of the machine controls.

Where a gear is produced on a gear shaper, an automatic gage Figs. 4 & 5, can be designed to meet the specific requirements of the operation. In addition to size variations, shaper-cut gears may have incomplete teeth due to an incomplete stroke of the machine. They may have a thick or thin tooth if the cutter did not correctly complete its traverse around the gear during generation. In checking this operation, a gage of a more advanced design is used. An electric indicator replaces the lever and microswitch mechanism. For checking, tooth length gears are fed to a set of fixed-center master gears. They cannot pass if the tooth length is incomplete. Gears roll by gravity through the checking stations. An escapement mechanism permits only one gear at a time to advance to the next checking station. After passing through the thick-centered master gears, where they are checked for tooth length, they advance to the next station where an arbor is inserted and the gear rotated by a motor-driven master gear to check for tooth thickness. Displacement of the master gear again controls the trap door beyond the checking station. If the gear passes this check, it rolls to third and final checking station where a size check is made with motorized and gaging master gear arrangement. Trap doors similarly direct reject gears to chutes that sort rejects as to type.

These are but a few of the ways that gear gaging has been accomplished. One thing to remember is that machines must be designed with utmost simplicity. Electrical components must be accessible for maintenance. As gear gaging machines are designed to increase production they must be designed with great versatility.

#### Application of In-Process Gear Gages

The exact type of automatic gage required for a particular operation depends upon the degree of automation refinement. In many cases only the gear inspection operation may be a feasible consideration. Most automatic gear gages have sufficient flexibility to permit broad application in lines having a variety of feed methods and machine tools. A typical application of an automatic gage is found at Buick Motor Division applied to a transmission

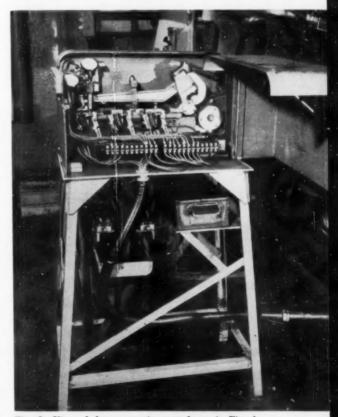
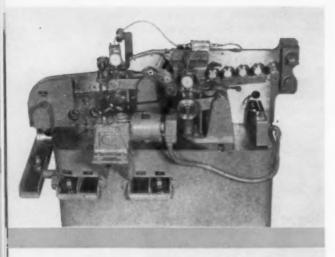


Fig. 3. View of the automatic gage shown in Fig. 4 with cover open to show the lever arm gaging mechanism and the compact mounting of the gaging units.



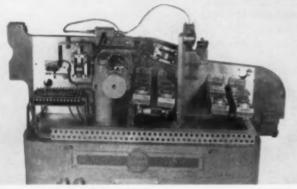


Fig. 4 & 5. (top) An automatic gear checker designed to check shaper-cut gears. The parts are fed into the gage at the right and are sorted according to their measured accuracy. (above) Rear view of the checker for shaper-cut gears with cover removed.

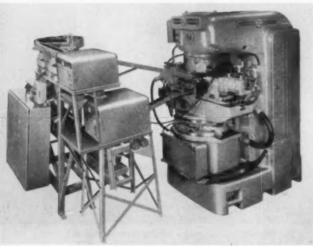


Fig. 6. Automatic gear gages used as in and out gages with a rotary gear shaving machine.

pinion production line that has been functioning since early 1955.

In this installation gears are directed from the hobbing machines to a vibrating hopper feed which operates intermittently according to the demand of the shaving machine. This keeps the chute in the automatic loader full of gears. Shaved gears leaving the machine roll into the chute to the automatic gear gage. Gears that do not pass inspection requirements are segregated in a partitioned pan according to salvageability. Gears that pass inspection roll onto a belt conveyor for disposition.

Automated gages can also be utilized effectively with partial automation setups. A hand-fed automatic gage may be used where a machine whose output it checks is also hand loaded and unloaded. No counting mechanism is provided with this type gage. Indicator lights on a separate panel tell the operator the reason for any rejection. A counting mechanism and automatic feed arrangement can be added, however, if it later becomes necessary to adapt it to fully automated lines.

It is also possible to use automatic gages as "in" and "out" gages Fig. 6, in conjunction with gear shaving operations. In a setup of this kind Fig. 7, a vibratory hopper feed device directs the gears to the "in" gage ahead of the shaving machine. An "out" gage checks the gears after they have been shaved. Disposition of gears is accomplished in the foregoing manner.

#### Sound Testing of Gears

The final check of the quality of a gear is the degree of quietness with which it operates with a mating gear. If a gear is too noisy, it will usually be rejected even though it apparently meets all dimensional requirements for accuracy. Heretofore sound testing of gears has been done by loading them on a gear speeder and running them in mesh with a master gear in both directions under load conditions. Gears were rejected on the opinion of the operator on his own hearing ability. Consistency of performance of an operator's "listening" ability varies with his fatigue and mental aptitude. Obvious flaws in this procedure brought about an electronic device Fig. 8, that would supplant the human error in sound testing. Electronic sound-discriminating devices can make more precise selection of gears of uniform sound characteristics.

Electronic sound-detecting equipment can be applied to automatically loaded gear speeders providing consistent and exact sound tests on automated lines. When using sound equipment, gears are fed from the main conveyor line to an automatic loader on the speeder. Gears are then run in mesh and a microphone placed near the area picks up any noise that the gears may generate. Any gears that do not meet the test requirements of the electronic gear

are automatically diverted from the line that carries the gear to the assembly floor.

The speed of the sound testing gages is illustrated with the use of a 16-tooth, 18 pitch, 20-degree pressure angle helical pinion for an automotive automatic transmission. Six of these automated sound discriminators and two operators sound test 14,000 gears per shift.

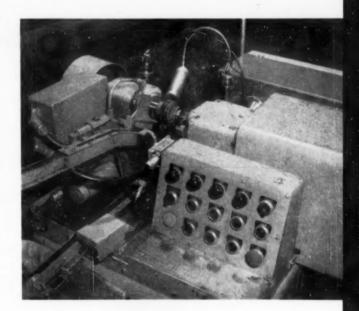
The benefits of sound testing can be applied to partial automation operations without sound discriminator equipment. Instead of electronic equipment OK'ing and rejecting gears, the operator diverts by hand any gears that do not meet the sound level requirements.

#### **Future of Automatic Gear Gages**

Gages described herein represent some of the approaches to in-process gaging on automated production lines. Minimum costs in gear production will never be achieved when only spot checks or statistical quality control methods are utilized. Checking of gear teeth has always been one of analyzing one dimension after the other on laboratory equipment. This method and the spot-check method admittedly permit the production of scrap and this is detected only after numerous rejects have been produced. The most economical method of producing gears is to check every one as it comes from the machine. The machine should be reset to correct the error immediately, either by automatic controls or by the operator. The expense of tearing

down an assembly because of a noisy gear is a prodigious one in comparison to the cost of adequate inspection.

There are automatic gages in the design state now that will automatically check and chart a series of individual checks on gear tooth dimensions. Gages of this type will enable producers of gears to take full advantage of automatic operations in the future.



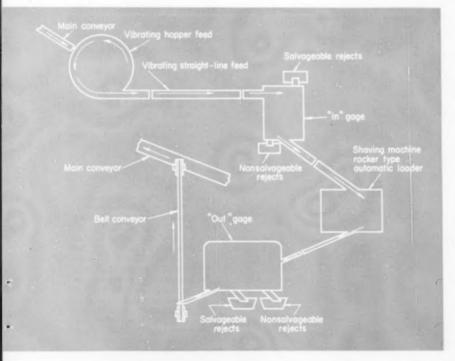


Fig. 7. (left) Schematic drawing of feed arrangement of the automatic in and our gear gaging setup.

Fig. 8. (above) Automatic gear speeder equipped with an electronic sound discriminating device. Microphone is visible at the rear of the master gear.

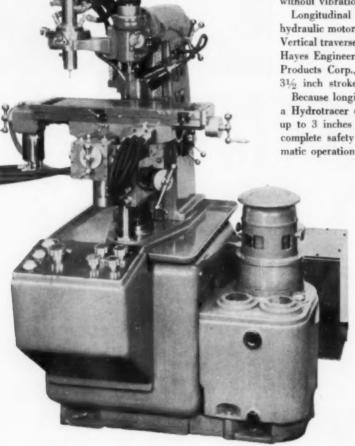
# designed for PRODUCTION

# Profile Miller Cuts Vertical Faces Without Digging In

This machine has been designed so that three-dimensional, automatic copy milling of dies can be accomplished to high accuracy with unskilled operators. Medium sized, the miller is constructed for rigidity without being clumsy. With the quill fully lowered and the overarm completely extended, a ½-inch wide slot ¾ inch deep can be milled in cast iron without vibration.

Longitudinal and cross traverse feeds are driven by hydraulic motors that can be disengaged during setup. Vertical traverse for the table of this machine, built by Hayes Engineers Ltd. and handled by The Wickman Products Corp., Oak Park, Mich., is achieved by a  $3\frac{1}{2}$  inch stroke cylinder for automatic profiling.

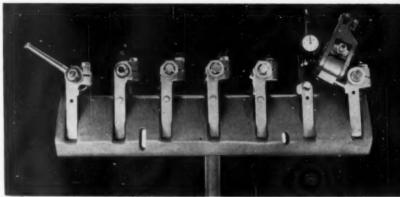
Because longitudinal traverse is controlled through a Hydrotracer copying valve, opposed vertical faces up to 3 inches high can be cut accurately and with complete safety in either direction under fully automatic operation.



VERTICAL MOVE-MENT of the knee is controlled through the tracer control valve. Speed of advance of the workpiece into the tool can be controlled by a manual valve to prevent overloading of the tool. Retraction of the work from the tool remains at full speed even when advance is slowed down. Longitudinal traverse of the table is also controlled through the same valve unit. Longi-tudinal traverse speed automatically increases or decreases to suit profiles encountered by the stylus in tracing the master. Cross traverse increments automatically take place at every reversal of longitudinal traverse.

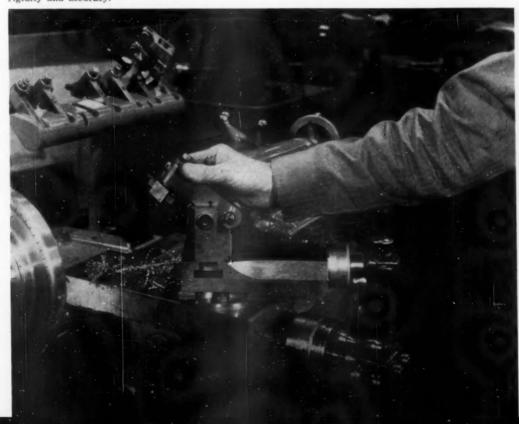
#### **Quick-Change Tools Speed Operations**

M inimum time is expended in machining small-lot parts requiring a variety of turning operations if quick-change, preset tools are used on one lathe. The Quik-Tool, developed by The Monarch Machine Tool Co. as an attachment for their 10-inch EE manufacturing and toolmakers lathe, satisfies this purpose. This attachment, with its associated toolholders, can avoid lengthy setups and reduce time required for tool changes.



SEVEN toolholders of the basic set are: three for turning, facing, grooving, threading and necking tools; a universal type for boring tools or bars, and turning tools; one for knurling, complete with six wheels, and one for mounting various dial indicators.

PRECISION tool block fits directly on compound rest of the lathe and any of seven toolholders can be quickly interchanged. Toolholders are self-positioning when slipped onto a locating pin and swung downward into a slot in the tool block. Neither alignment nor clamping is required since precision of the matching units assures both rigidity and accuracy.

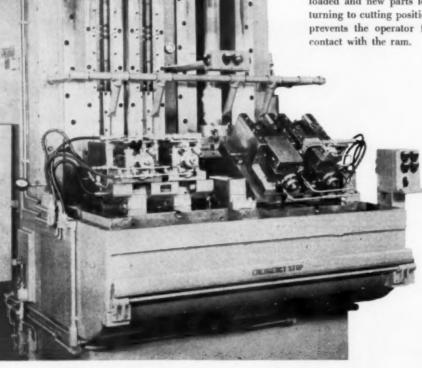


#### Broach Fixture Tilts for Ease of Loading

A utomatically actuated tilt-up fixtures speed broaching of connecting rod half rounds and mating faces by providing easy loading and operator safety. Fixtures are mounted in duplicate on a 15-ton, 66-inch stroke Model RT dual-ram broaching machine. Fixtures, broaches and machine were designed and built by Colonial Broach and Machine Co.

During loading, machine table is in full rear position with fixture tilted upward approximately 45 deg toward operator. Connecting rod forgings can be dropped into fixture; tilt causes parts to slide under locators. As table and fixture move in, a roller bearing in a cam track returns the fixture to cutting position.

At end of cutting stroke, cycle is reversed. Machine table moves outward, fixture tilts into unloading position and clamps release. Spring ejectors push broached parts out so they can be grasped easily. One fixture is in cutting position while the other is being unloaded. Broached parts can be unloaded and new parts loaded while the ram is returning to cutting position because the tilted fixture prevents the operator from coming in accidental contact with the ram.

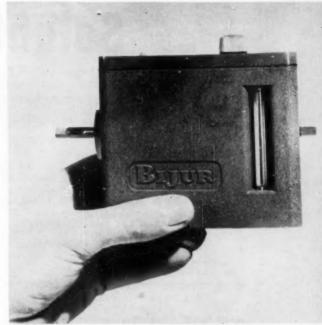


TRUNNION type fixtures are built as two separate components. The fixture base and trunnion plate-which contain the locators, hydraulic clamps and spring ejectors-are mounted on the broaching machine table. The tilting mechanism consists of a roller bearing on the trunnion plate. engaged in a cam track. The cam-track block is mounted on the bed of the machine. Tilting plate and fixture base are held in positive alignment by four hardened V-locators that compensate for clearance required at pivot.

#### LUBRICATING SYSTEM helps maintain accuracy

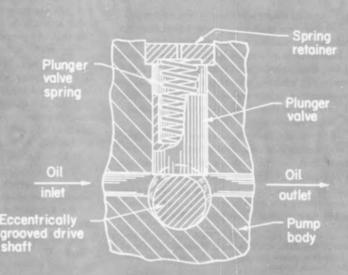
Distortion-free lubrication of close-tolerance bearings can be achieved if fluctutions in lubricating film can be prevented. An automatic lubricator with a constant-pressure pump, developed by Bijur Lubricating Corp., provides good lubrication for precision machine tools and test equipment.

Periodic hand oiling or cyclic lubrication creates a rising and falling action in tableway and other bearings, limiting accuracy. This lubricator maintains a boundary film of oil at a constant pressure. Excessive oil is not required and any lubricant lost from the system is quickly replaced.



ROTARY PUMP is mounted in a die-cast reservoir of one pint capacity. The complete unit includes an inlet filter and a reservoir level gage. The lubricator shaft runs at 1800 rpm; motor 1/50-hp.

S P R I N G-L O A D E D plunger valve rides in a 0.05 inch deep eccentric groove in the pump shaft. This valve acts as a seal between inlet and outlet ports, and as an unloading valve to maintain constant pressure in the lubricating system. As the shaft rotates, oil is drawn through the filter to the sweep area of the groove. Oil passes into distribution system only when the groove is down.



## Soluble Oils

By R. K. Gould and R. C. Givens

Technical Service Div. Research and Technical Dept. The Texas Co.

During the past fifteen years, soluble oils have come to occupy a place of prominence in the field of cutting fluids. The authors present the story of soluble oils, including their composition, handling in storage, preparation of emulsions, and factors affecting performance.

ALL CUTTING FLUIDS HAVE two primary functions: to dissipate heat and to provide lubrication between the tool and the work. Other considerations are improvement of surface finish, prolongation of tool life, chip removal, and prevention of rust and corrosion. In addition, a cutting fluid should in no way damage or impair the operation of a machine tool, and its cost should be economically consistent with its performance.

Two types of cutting oils are in general use: Mineral cutting oils composed of straight mineral, mineral lard, or EP oils; and soluble cutting oils consisting of mineral oils which have been emulsified so that they can be mixed with water. Mineral cutting oils have superior lubricating qualities but they dissipate heat poorly. Water, on the

Abstracted from paper 24T51, "Soluble Oils," presented at the 24th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society headquarters. other hand, is an excellent coolant but has little or no value as a lubricant.

In theory soluble oil emulsions combine the superior lubricity of mineral oils with the desirable cooling characteristics of water. In practice the lubricity of aqueous emulsions is limited and control over the undesirable characteristics of water, such as the tendency to promote rust, is not perfect. Nevertheless a wealth of information on the manufacture and application of soluble oils has been developed, enabling them to become useful cutting fluids.

General Properties and Formulation: Soluble oils are generally bright and clear and do not differ appreciably from mineral cutting oils in appearance. As prepared by the manufacturers they are generally water-in-oil emulsions and do not obey Newtonian laws as do straight mineral oils. It is this factor which necessitates better care in handling and use than is required for mineral cutting oils. All emulsions are relatively unstable systems. A primary problem of the research chemist has been to curb and control internal changes in soluble oils to make them dependable and practical formulations.

Principal components of a soluble oil are mineral oil, emulsifiers, additives, coupling agents and solvents. The character of the mineral oil selected for the formulation is of primary importance since the remaining ingredients to be used must be proportioned and blended to obtain perfect initial uniformity and good storage stability. The viscosity of the oil selected is dependent upon the intended

application and the lubricity required.

Emulsifiers are selected and proportioned on the basis of compatability with the other constituents of the formulation. They are normally alkali soaps of sulfonic, carboxylic or rosin acids.

The purpose of additives is to provide soluble oil emulsions with the attributes of mineral cutting oils. The degree to which mineral oil properties can be imparted to emulsions is limited by many factors, including the concentration of the additives used. The concentration of additive must permit good stability in both the soluble oil and its emulsions. Duplication of the full lubricity of mineral oils is restricted by the fact that in normal operations soluble oils are diluted from 5 to 100 times with water, which limits the quantity of oil and additive actually applied in the cutting operation. Additives are also used to improve rust protection and resistance to bacteria.

Coupling agents or solvents are used to bind the mix into a homogeneous blend and give other desirable physical characteristics such as lower viscosity and improved pumping qualities.

In addition, soluble oils have balanced water contents and fixed levels of acidity or alkalinity, factors which may also affect product stability and emulsification.

Characteristics which can be varied by a proper selection and balance of the soluble oil composition include over-all stability, low temperature and hard water stability, ease of emulsification and emulsion stability, viscosity and ease of pumping, dispersive power, detergency, chip settling qualities, rust protection, tool life and resistance to bacteria.

Handling Soluble Oils: While soluble oils are complex, they are relatively stable and dependable products if conditions to which they are sensitive are understood and properly controlled. Three precautions should be observed in handling soluble oils prior to mixing with water:

- Avoid overheating or excessive aeration: The water and solvent balance in a formulation may be upset by overheating or excessive aeration, resulting in instability. Heating may accelerate changes in acidity which also could affect stability.
- Avoid contamination: Soluble oils from different suppliers should not be mixed since the mixture may not perform as well as either might do individually. Contamination of soluble oils with additional mineral oils may also have adverse effects.
- Protect from alternate freezing and thawing: Soluble
  oils are not particularly sensitive to low temperatures
  and generally may be frozen without serious deterioration. Continued intermittent freezing and thawing, however, may upset the balance of the components and affect stability.

Emulsification: In use, soluble oils are mixed with water in ratios varying from five parts water to one part soluble oil to over 100 parts water to one part soluble oil, depending on the application. Irrespective of the quality of a soluble oil, its utility and effectiveness in the cutting fluid will be impaired unless good initial emulsification is obtained and maintained throughout use. The ease with which different types of soluble oils will emulsify varies and some may require more agitation than others. It is essential that the soluble oil be added to the water, and the mix should be agitated sufficiently to obtain a stable emulsion with water in a continuous phase and oil in a dispersed phase.

The heavy metal salts in hard water destroy some of the emulsifiers and act to weaken the stabilizing action of the remaining emulsifiers. So-called hard water soluble oils resist this action, at least in waters of 300 to 450 parts per million hardness. It is more effective to treat the water to reduce the hardness. This should be done prior to mixing.

High total solids content in the water used may reduce emulsion stability through a "salting out" effect. High acidity of water usually indicates the presence of carbon dioxide, and tends to cause emulsion instability. Blowing air through the water or treatment with mild alkalies prior to use will correct this condition. High bacteria and algae content shorten the service life of emulsions but can be controlled through proper water treatment.

Care of Emulsions: Soluble oils are sterile as delivered to the customer and generally contain agents to destroy bacteria or inhibit their growth. Emulsions can, however, support bacterial growth in the water phase, and inhibitors in the oils cannot protect emulsions against all pollution that may occur in use. If allowed to develop unchecked, bacteria will destroy essential ingredients through metabolism. The resultant waste products also cause emulsions to deteriorate, and may cause unpleasant orders.

There are many ways in which bacterial contamination of emulsions can occur. The microorganisms may be present in the water used, particularly in untreated or improperly treated river waters, or they may come from the worker's hands, workpieces or refuse in the emulsion. As a first step in protecting emulsions from bacteria, it is extremely desirable to use water of zero to low bacteria content. The next step is to be sure that the system in which the emulsion will be used is clean and that the equipment and emulsion are kept as clean as possible during use.

Cleaning Emulsion Systems: Steps in an adequate cleaning procedure for emulsion systems are:

- 1. Drain or pump used emulsion from the system.
- Disassemble as much of the system as feasible and manually remove chips, sludge or other contaminants.
- Reassemble the equipment and circulate a suitable detergent through the system.

- Drain the detergent solution and circulate an antiseptic or disinfectant solution. Be sure it reaches all surfaces with which the emulsion comes in contact.
- Drain the disinfectant solution, flush the system with clean water and recharge with fresh emulsion.

Emulsion Life: It is impossible to predict the service life of an emulsion, since this will vary appreciably depending upon mechanical conditions and the general cleanliness exercised in the operation.

Probably the greatest single factor contributing to soluble oil emulsion deterioration is bacterial attack. Even if the system has been thoroughly cleaned, it is virtually impossible to avoid recontamination, but the harmful effects can be minimized. Cleanliness is a practical means for controlling bacterial contamination. Soluble oil systems should not serve as refuse disposals, spittoons or wash basins. Workpieces themselves may be a source of contamination and bacteria are present even in the shop air.

Care should be taken in adding bactericides to an emulsion since they can have extremely adverse effects upon stability and subsequent performance and may cause dermatitis if present in excessive quantities.

Parts being machined may carry rustproofing compounds, brazing fluxes, cutting oils or dirt and rust from other operations. High concentrations of these materials may shorten emulsion life.

The consequences of adding materials to soluble oil emulsions should be determined prior to use. Extraneous materials may be harmless or they may have pronounced harmful effects, depending on their nature or on handling conditions.

It is a common occurrence for mineral oils from machine leakage to contaminate soluble oil systems. In excessive amounts the mineral oil covers the emulsion in the sump, shutting off oxygen and providing a breeding ground for undesirable bacteria. When mineral oils become intimately mixed with the emulsion during use they may actually extract some of the oil soluble emulsifier and additive components of the soluble oil and take them out of use. This factor may also interfere with determinations of emulsion strength by causing the emulsion to appear rich in oil component.

Water may also be lost from the emulsion. Operating difficulties can result, particularly in grinding operations, where chip settling may be hindered. Oily components of an emulsion may be absorbed by chips, particularly in the grinding of cast iron, making the emulsion too lean for use.

It is necessary to watch all of these factors and to keep a check on emulsion strength. Use of three general safeguards makes it possible to obtain the longest possible service life from an emulsion. They are applicable whether only one machine or a large system supplying many machines in involved.

- Keep close check on control of emulsion strength.
   Be sure the oil content represents constituent soluble oil and not oil from contamination.
- Eliminate as many sources of contamination as possible.
- Remove chips, grinding dirt and other contaminants as soon as possible.

Filtration: Numerous emulsion cleaning devices are available. Paper filters, magnetic filters, flotation devices and others may be used. Many plants use central soluble oil systems which employ special devices for removing solids and aerating and deviling emulsions. These systems can be operated for long periods of time without changing emulsions if high levels of cleanliness are maintained. When conditions of extreme dirtiness exist, emulsion life even in this type of system is relatively short.

Dermatitis: The occurence of oil dermatitis is often attributed solely to microorganisms in the cutting fluids themselves. Repeated laboratory investigations have demonstrated that bacteria present in used emulsions are harmless. Dermatitis is caused by germs normally present on the skin. Considerable study has shown that good personal cleanliness is the best means of avoiding skin trouble. The use of protective skin creams may also be helpful.

Reasonable care of soluble oil emulsions will result in extended service life and better performance. Practical and economic considerations will usually dictate how far the consumer of soluble emulsions should go with regard to cleanliness practices and emulsion care.

#### Prolonging Milling Cutter Life

Application engineers of the Carboloy Dept. of General Electric point out that there are two basic types of failures of carbide-tipped milling cutters. Tougher or less wear-resistant carbides may fail due to widening of the wear land and the more wearresistant carbides may fail through chipping of the cutting edges. If a cutter is run too long before the cutting edges are inspected, the wide wear land

may indicate that a more wear-resistant carbide should have been used. Actually, if the cutting edges had been inspected with a magnifying glass after milling the first piece they would have indicated that cutter failure originated from minute chipping and instead of using a more wear-resistant carbide the next less wear-resistant or tougher grade should be used.

# CODING SYSTEM

facilitates
control
of
maintenance
costs

By Edward E. Griffiths

Director of Expense Control Headquarters Manufacturing Div. Westinghouse Electric Corp.

Tool, Machinery and equipment maintenance costs are kept in line at Westinghouse by means of a planned maintenance expense control program. The basis for the program is a series of simple maintenance records which give visibility to problem areas. Committees made up of representatives from manufacturing and maintenance departments are responsible for seeing that any necessary corrective action is taken and for the over-all progress of the program in reducing manufacturing costs.

Cutting Tool Program: The first step in the maintenance program for cutting tools starts when it is necessary to replace a tool. The workman responsible fills out a tool requisition form and takes it and the tool to be replaced to his foreman. The foreman carries a plastic card on which over 60 cutting tool troubles are listed by number. The foreman and the workman determine the cause of tool failure and the foreman enters the appropriate number on the tool requisi-

Abstracted from paper 24T43, "Preventive Maintenance, Tools, Dies, Fixtures and Equipment," presented at the 24th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society headquarters.

tion form, which is turned into the tool crib with the damaged tool.

The secretary of the committee responsible for reducing cutting tool maintenance costs uses information obtained from the tool requisition forms in preparing a tally sheet of causes of tool failures, Fig. 2. In monthly meetings the tool committee analyzes the tool failures and recommends corrective action where needed.

In order to receive full benefit from the program, steps are taken to increase the cost consciousness of participating personnel. Expense reports are used to evaluate the progress of the program and to highlight cost trends. A portion of a typical expense report submitted to the tool committee is shown as Fig. 3. It will be noted that the cost of broken tools for each hour of production is given, as well as the total number of broken tools during the month in question.

Machine Tool and Equipment Program: Responsibility for the machine tool and equipment maintenance program is assigned to a committee which, like the tool committee, is made up of representatives of the maintenance and manufacturing departments, giving all interested personnel an opportunity to participate in the program. Meetings are held monthly or more often if conditions warrant. The committee reviews machine breakdown and maintenance inspection reports, as well as total

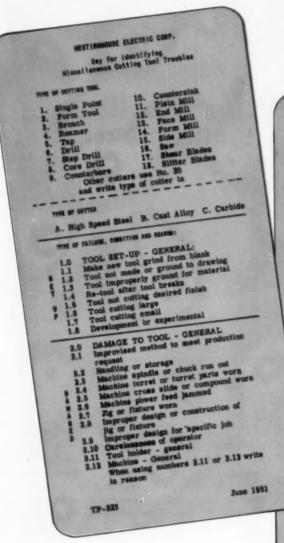


Fig. 1. Plastic card used by foreman to obtain code number for tool trouble.

#### MEST INGHOUSE ELECTRIC CORP. TOOL DULL - GEREAGE Speed too great Outer corners broken down or burnt Broken tooth or teeth Cutting edge chipped Improper or insufficient lubrication Improperly ground for material Minterial not uniform, hard castings TOOL DULL - GENERAL bull and worn out Not demagnitised Improper heat treatment Grinding strains 3.10 3.13 Faulty set up Improper design for job 3.15 BROKEN TOOL - GENERAL Power failure Improperly ground Not ground to drawing Feed too great Speed too great Flutes or parts clogged with chips 4.6 4.7 4.8 4.9 4.10 4.11 4.12 4.13 Too much stock for finishing tool Too much stock for finance Spring or back lash Work not securely fastened Tool not set up properly Overhang of tip too great Tool allowed to hit hardens Tool allowed to hit hardened parti Grabbing when breaking through Improper brasing Improper or insufficient lubricant Entering work in rapid traverse Sand holes Material not uniform Improper design for job 4.14 4.16 4.18 5.1 5.2 5.3 5.4 5.6 Scored shank or hole Broken wedge or tooth locking device Tang bent or broken Keyway worn or broken Bent, work not securely fastened not properly supp TP-333 June 1981

#### (TALLY SHEET OF FAILURES) Work's Department No. Miscellaneous Cutting Tools - Tally Sheet Total Occurrences - Month of \_\_\_\_Sheet # \_\_\_of \_ No. CODE CODE No. TALLY TOTAL TALLY TOTAL No. TALLY TOTAL TALLY TOTAL TALLY TOTAL 1.0 4.0 1.1 4.1 1.2 4.2 1.3 4.3 1.4 4.4 1.5 4.5 1.6 4.6 4.7 1.8 4.8 4.9 4.10 2.0 4.11 4.12

Fig. 2. Tally sheet on which tool troubles for month are tabulated. Code numbers correspond to those on plastic card used by foreman.

Fig. 3. Sample expense report summarizing cost of tool failures per net operating hour and total number of broken tools by type of tool.

	Expense Repo	rt -	June				
			Breakd	lown o	d dollar	cost	:
			April		May		June
Labor	within the department	\$	817	\$	1220	\$	1648
Labor	outside the department		1514		1560		1407
Materi	al purchased from stores		676		400		413
Materi	al purchased from outside		1823		674		540
	Total \$	\$	4820	\$	3854	\$	4018
Total	net allowed hours	1	5, 805	16	, 431	16	, 201
Cost p	er net operating hour	\$	. 30	\$	. 23	\$	. 24
Base f	or measuremen		. 31		. 31		. 31
6 Mon	ths moving average to date		. 27		. 26		. 26
Reduc	tion over base	// /	PLI	-	. 05		. 05
			Total	Broke	n Tools	by T	уре
No.	Туре		April		May		June
1-A	Single point H. S. S.		14		12		14
1-C	Single point T. C.		31		36		24
4-A	Reamer		6		4		4
5-A	Тар		46		38		37
6-A	Drill		16		21		12
12-A	End mill		6		. 4		1
13-A	Face mill		2				1

expenses, and plans an effective maintenance schedule. Minutes of the meeting are distributed to all interested personnel, advising them of necessary action.

As in the case of cutting tools, a coding system is used to identify types of troubles. The plastic card illustrated, Fig. 4, is used for machine tool repairs and similar cards identify equipment repairs. Appropriate code numbers are placed on the work requisition and are subsequently tabulated to obtain a record of the frequency of failures, and the in-

dividual machines, subassemblies and machine parts affected.

Machine maintenance record cards, Fig. 5, are used to indicate accumulated maintenance costs for individual machines. As the amount of data on a given machine increases, it becomes possible to compare maintenance costs with the cost of new equipment to determine whether replacement is justified.

After maintenance records have been established for a long enough period to show a fairly complete story on machine failures, a log on part failures by machine tool types, Fig. 6, is established. The log makes it possible to determine which machines are the most costly to maintain. Causes of the breakdowns are analyzed, comparisons with similar machines in other locations are made, and action is taken to correct the failures and to set standards to help prevent the same types of failures from occurring in the future.

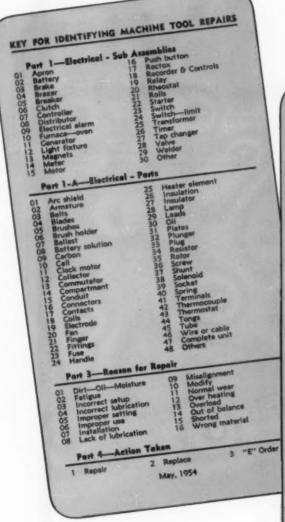


Fig. 4. Plastic card listing code numbers for machine tool repairs.

11 12 13 14 15 16 17 18 19 19 19 19 19 19 19 19 19 19 19 19 19	t 2-A—Meci Apron Arm assembly Air control Base Bridge Brake Bed Boom Carriage Clutch Column Coolant syste Cross rail Cross slide Crank shaft	56 Cylind 57 Drive 58 Drum 59 Electre 60 Fan 61 Face p 62 Feed b 63 Feed mech 64 Frame 65 Head m66 Houst 67 Hoist 68 Knee 69 Motor 70 Pump	r 71 72 73 73 74 75 late 76 0x 77 78 anism79 80 81 82 83 84 85	Rem Regulator Saddle Spindle Steering me Stock feed Support (or Table Tanks Tail Stock Trolley Truck Trurek Turret Unreelers Others	
_	2-A-Mec				
02 03 04 05 06 07 08 09 10 11 11 11 11 11 11 11 11 11 11 11 11	Adjusting screw Arm Barnd Bearm Bearing Belt Blades Bracket Bucket Burner Bushing Cable Cam shaft Chain Chutes Clampe College Connecting re Couping Cups Crank shaft Diaphragm Disc Dog Drive shaft t 3—Reason	49 Nut 50 Nozzi 51 Packir 52 Pedal 53 Pins 54 Pintle 55 Piping for Repair	62 63 64 65 66 67 78 69 70 172 haft 73 74 75 76 77 8 78 81 82	Piston Plate Platforms Plug Pulley Rack Rarn Ratainer Rings Rolls Shefter Silder Silder Silder Silder Silder Silder Silder Soring Tires Toggle Tuggle Tuggle Ways Wheel Worm Complete I Others	Jnit
01 02 03 04 05	Dirt—Oil— Moisture Fatigue Incorrect set Incorrect Iubrication Improper set	08 Lac up 09 Mis 10 Mo ting 11 No	proper usitaliation ik of brication alignmen dify	12 Over 13 Over 14 Out o 15 Short t 16 Wror mat	ME .
1	Repair		lace	3 "5"	Order

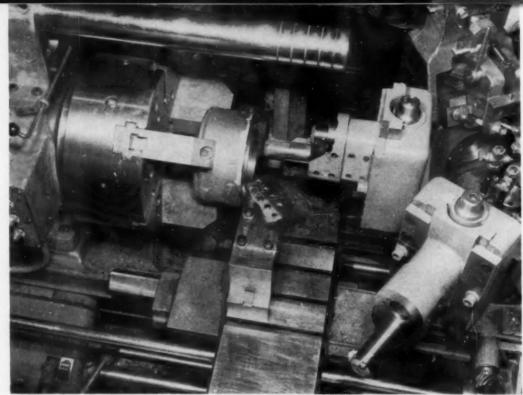
AKE & SIZE						DATE INSTALL	.ED	ORIGINAL COS	1
ANNUAL MAINT. COST	19	19		19	19.		19	19	19
DATE	REQ. NO.	P	ART FAI	LURE CODE	1	MAT	ERIAL	LABOR	ACCUMULATED
DATE	REQ. NO.	SUB. ASS'Y	PART	CAUSE	ACTION	P.O. NO.	cost	COST	COST
								-	
		+					-	+	
							1		
	×	-	-	-	-		-	+	
-									
							1		
		-					-	-	
YPE								MACHINE NO.	

Fig. 5. Machine tool maintenance record card shows frequency and type of repairs.

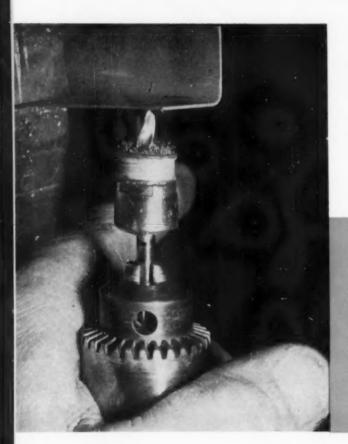
Fig. 6. Log of part failures by machine tool types permits comparison of simliar machines from the standpoint of maintenance costs.

	January	February	March
No. of Press Failures	10	12	11
No. of Clutch Failures	1-B	2-B	1-B
	2-C	1-C	1-F
No. of Brake Failures	1-B	1-M	1-M
No. of Pitman Failures	2-B	2-B	3-B
	2-F	3-F	2-F
No. of Knocker Failures	2-C	2-M	2-C
No. of Bed Alignment Repairs	1-M	1-M	1-M
All others	3	1	1

Code letters "B, " "C, " "F, " and "M" refer to manufacturer's name.



-Photo courtesy Gisholt Machine Co.

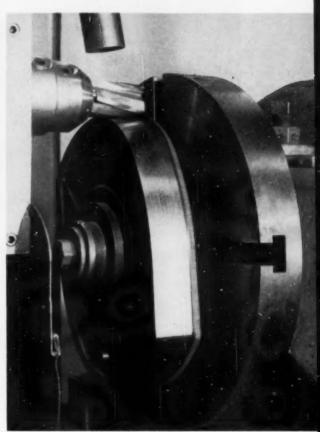


TURNING OPERATIONS on Meehanite pump body are speeded by this setup on automatic turret lathe. Special cams and adjustable slide tops permit use of front and rear cross slides. Recess boring tools reduce the number of turret stations used. Operations on the 3%-inch workpiece take 7.4 minutes floor-to-floor time.

TOOLING INCENUITY is typified by this development—a combination tool which removes aluminum cladding from duralumin and drills holes in one operation. According to engineers at Glenn L. Martin, the purpose is to insure good electrical connections. A standard wire brush is simply attached to the drill.

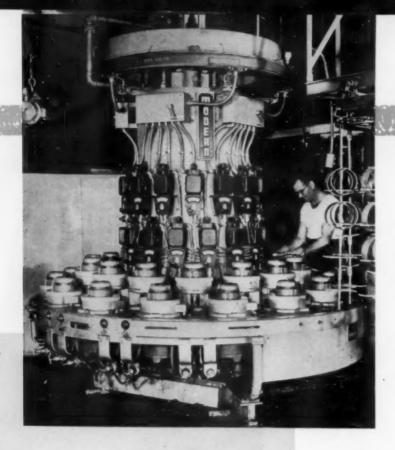


BETTER ASSEMBLY of frame and car body is assured by new process developed by Chevrolet engineers in which 12 body bolt holes in frame brackets are pierced after attachment. Commonly holes are pierced in the brackets separately before they are welded to the frame. Now a special hydraulic machine is used for the operation after the frame has been assembled.



cam milling has been speeded by use of helical carbide and mills at Sheridan Machine Co., Easton, Pa. Formerly HSS end mills were reground after producing 10 of the cast-iron pieces. Finish is improved and cycle time slashed by 12 minutes on typical parts. Three cams are being machined at once, giving further savings. Speed is 600 rpm and depth of cut is ½ inch using Wendt-Sonis cutters.

# TOOLS at work



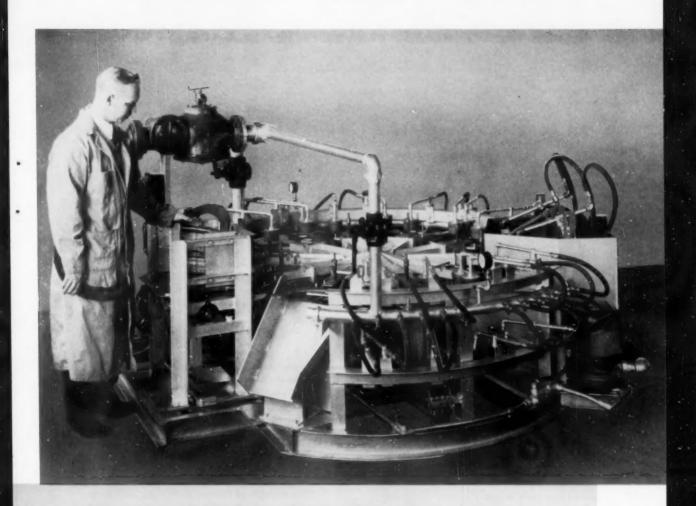
ANOTHER MERRY-GO-ROUND transfer machine produces transmission brake band assemblies at Warner Gear plant in Muncie, Ind. Molded linings are bonded to metal bands in 30 stations at a production rate of 180 per hour on the rotary machine built by Modern Industrial Engineering Co. of Detroit. Parts are loaded on the segmented mandrels manually and clamped pneumatically.

BY POSITIONING intake manifolds on edge and transferring them between stations on vertical angular rails, all turnovers are elimininated from automated machining operations. This design concept cuts the over-all length of the new Snyder in line transfer machine, avoids turnover fixtures and lets chips fall away from the part by gravity. Horizontal way units are utilized in milling, drilling and tapping the cast-iron workpieces.





#### TOOLS at work



AUTOMATIC WEB-HARDENING machine employs index-dial transfer principles. Replacing manual torch operation, this machine, designed and built by Selas Corp. of America, automatically treats 165 pieces per hour, saving \$175 a day in fuel costs alone. Each part is selectively hardened by indexing through four heating stations, a spray water quench, three heating stations for draw and an automatic discharge.

### where ENGINEERS serve

By Robert E. McKee\*

Associate Prof. Mechanical Engineering University of Michigan Ann Arbor, Mich.

To assist in future planning of engineering courses, the ASTE National Education Committee recently made surveys of industry and alumni. These surveys show the current activities of mechanical engineering graduates, in what areas more training is needed and how curricula can be dovetailed with actual job requirements.

M ORE MECHANICAL AND INDUSTRIAL engineering graduates are now going into manufacturing than any other activity. Product design is next in importance with sales, research and administration also claiming substantial percentages. Heat-power work, traditionally the academic favorite, lags far behind in today's industrial world.

In the light of these results, the casual interest in tool engineering training in American colleges and universities is surprising. A previous survey by the Committee disclosed that only a relatively few engineering schools offered a substantial number of courses in tool or production engineering subjects.

Data used in this new study were secured by means of a mail survey, of graduates from these schools: Lehigh University, Bethlehem, Pa.; University of Michigan, Ann Arbor, Mich.; Purdue University, Lafayette, Ind.; University of Tennessee, Knoxville, Tenn.; University of Texas, Austin,

Mechanical and industrial engineering alumni of the classes of 1950, 1951 and 1952 were queried because they represent the most recent graduates who would have completed training programs in industry and been assigned to given projects and responsibilities. Mechanical and industrial engineers were selected for survey since their academic training represents that most pertinent to the metalworking industry.

General job function categories offered for selection by the alumni were the following:

- 1. Administration
- 2. Heat-power
- 3. Maintenance
- Manufacturing, including production processes, tooling and methods
- 5. Product design and development
- 6. Research
- 7. Sales
- 8. Other

As an example of returns, there were 2459 questionnaires sent to Purdue University alumni and a total return of 1322 for a percentage of 54. These returns gave 1430 selections of activity showing an average of slightly more than one selection per return. All other schools indicated a 50 percent plus return from their alumni.

Returns from the various schools were fairly consistant. For example, selections of manufacturing engineering varied from a low of 18.7 percent at University of Texas to a high of 32.5 percent at University of Tennessee. The average over-all was

<sup>&</sup>lt;sup>o</sup> Senior member ASTE Ann Arbor Chapter. Abstracted from presentation given at National Educator's Conference, Chicago, March 25, 1956.

# industry

25.5 percent. In every instance, however, manufacturing was the highest in number of selections.

Average of all data is shown in Fig. 1. Although insufficient information was secured for a positive identification, it is quite probable that most of the engineers in maintenance could likewise be grouped in the manufacturing engineering classification. It is also probable that the group in administration could be divided between product design and manufacturing engineering. In any event, this survey clearly indicates the growing importance of manufacturing engineering and the increased emphasis on this field of activity in industry. This trend could be anticipated because of the phenomenal growth of automation, automatic machinery generally and appropriations for tooling and production equipment in recent years. Thus, a whole new area of engineering responsibilities has been opened up which industry will only entrust to technically

Table 1—Miscellaneous Occupational Activities Reported by Alumni Society

Number	Activity	Number	Activity
29	Test & Development	2	Management Trainer
	Engineer	2	Service Manager
26	Armed Services	1	Cemetary Manager
15	Teaching	1	Chemical Plants
11	Advanced Degrees	1	Municipal Engineer
10	Oil Companies Law	1	Management Consult-
8	Consulting Engineers	1	Missionary Work
6	Construction Engineer	1	Life Insurance
	ing	1	Farming
5	<b>Building Contractor</b>	1	Lettuce Grower
3	Medicine	1	Operating Dog and
3	Editorial Work		Suds Drive-in
3	Rate Engineer	1	Housewife
2	Stock Brokerage	1	Funeral Director
2	Real Estate	1	Field Engineer
2	Atomic Energy Com- mission	. 1	KP, Guard & Prison Chaser
2	Owners of Businesses	1	Architectural Eng.

qualified personnel in the years ahead.

The increased importance of sales and research activities as fields of work for graduate engineers is another salient fact apparent. In general, the percentages for research were higher for mechanical than for industrial engineers. By contrast, the industrial degree holder showed slightly more activity in sales than the mechanical.

A wide variety of activities was included in the "Other" category. The diversity of occupations gives evidence to the general impression that engineering training provides a background for successful activity in many fields of endeavor. Actual numbers in this category are shown in TABLE 1.

An additional question, relative to suggested curriculum emphasis, was included in the Purdue survey. Results of 936 replies are shown in Fig. 2. The largest number of alumni, 130 replies, recommended more emphasis on social sciences with English second high, being mentioned in 152 responses. Manufacturing processes were third with 111 replies and mathematics fourth with a value of 101 selections.

#### Industry Survey

To check on the accuracy of the alumni survey, an additional survey was conducted by requesting information regarding the job assignment of 1952 mechanical and industrial engineering graduates employed by 1050 companies. The results were grouped under nine headings based on number of employees, as shown in TABLE 2.

The number of contracts per group was based on a frequency distribution curve to allow the most contacts for companies with a medium number of employees and the fewest for companies of Group 1 and Group 9.

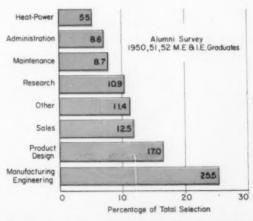


Fig. 1. Area of employment of mechanical and industrial engineering graduates of five engineering schools.

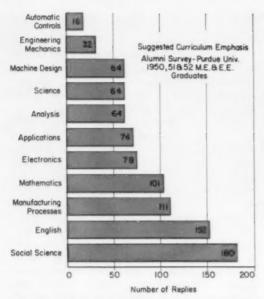


Fig. 2. Subjects suggested for greater emphasis by engineering graduates, Purdue University, based on 936 replies.

The basis used for selecting companies from which the sample was taken was as follows:

- All corporations in metalworking with two or more plants
- All corporations in metalworking trades employing 500 or more
- 3. All tool and die plants employing 50 or more
- 4. All foundries employing 75 or more
- 5. All machine tool manufacturers or rebuilders
- All steel, iron, copper, brass, aluminum, zinc, titanium or other commercial metal producers

The 1050 companies surveyed were chosen from this list, then, in accordance with the frequency distribution shown in Table 2. Of these, 318 responses provided information on the present assignments of graduates of mechanical and industrial engineering. The highest value showed 27.2 percent in manufacturing processes, 26.7 percent of the graduates no

Table 2—Industry Survey of 1952 ME and IE Graduates in Metalworking

Group Number	Number of Companies Contacted	Size (Number of Employees)
1	25	1-49
3	75 125	50-99 100-199
4 .	175 250	200-499 500-999
6	175	1000-1999
7	125	2000-4999
8	75	5000-14,999
9	25	15,000 & over
	1050	

longer employed by the company in question, and 24.3 percent in design and development work. Other values range correspondingly downward. The figures, adjusted to eliminate those no longer employed by the surveyed companies, are shown in Fig. 3. These revised percentages, showing active employees only, indicate that 37.0 percent are in manufacturing; 33.1 percent in design and development; 14.2 percent in sales; 8.9 percent in research and 6.8 percent in other activities. The sum of the first two categories represents 70.1 percent of the total response—a value slightly higher than to the published figure of 67.6 percent of mechanical engineers engaged in manufacturing activities as reported by the U.S. Bureau of Labor in a 1946 survey.

With allowances made for the limited number of categories on the industry survey, the data obtained from the alumni survey show a high correlation. For example, values for the sales category are 12.5 percent for alumni and 14.2 percent from the industry survey. Value for the research category is lower by 2 percent for the industry survey as compared with the alumni poll.

It was felt that results confirmed the validity of statistical methods used for the survey. Because of individual requirements and variations between schools, however, it is suggested that additional surveys of this type can be profitably conducted by other institutions. This survey will have served its purpose if it is used as a frame of reference for educators and institutions in revising their curricula of engineering subjects.

The trends established may well serve as an indication of industry needs. Moreover, an increase in the number of technically trained men to be used in engineering of manufacturing processes can be predicted from the data. With rapid developments in mechanization, high-production operations, new types of machines and automatic controls, engineers trained for manufacturing will be mandatory in industry of the future. Educators of today should feel responsible for preparing graduates for tomorrow's engineering.



Fig. 3. Work assignment of engineering graduates as reported by selected employers.



#### dimensional control through heat treat

By John W. Greve

Editor

OFTEN DISTORTION RESULTING from heat treating can be effectively compensated for in production. To make such a program economical, however, usually involves large production runs to justify the controls necessary.

These controls apply to every step and every operation in the production of the part. Included are control of material analysis, machining operations and, especially, heat treatment. Any variation from material analysis through heat treat must be studied and adjustments made to produce the desired effects. In fact the difference between a sharp and a dull tool could result in the program being out of control and adversely affect the final dimensions of the part.

Most operations on steel leave internal stresses of some magnitude locked in the material. Starting with the rolling operations to produce the bar stock, each succeeding operation adds or releases internal stresses, whether forming, machining or grinding is involved. Subsequent heat treatment may release the stresses caused by working the material but



Fig. 1. Checking the lead on a green planetary pinion. Machining specifications have been modified to allow for heat-treat distortion.

#### TOOL ENGINEERING



creates others during the quench cycle, which provides the mechanical properties desired.

To assure that finished parts meet design specifications, dimensions for the machined part are adjusted to compensate for any size change or distortion that may result from heat treatment. This requires considerable experience on the part of the tool engineering staff as well as quantities of production to justify setting up the elaborate controls required. Close coordination of design, processing, manufacturing, metallurgy and inspection, Fig. 1. are vital to the program. After experience has been gained and controls established for a production run, the economies and benefits that result are well worth the effort and extremely gratifying.

Also, the data gained during the production of each part are useful for predicting the distortion in other designs, shortening the period for each succeeding trial test. Eventually sufficient information would become available to predict accurately the machining dimensions or "green dimensions" of the workpiece. The trial run then could be simplified to verify the calculated predictions.

Ultimate success depends upon controlled heat treatment to give minimum distortion and consistent size change. Finishing operations after heat treatment are obviated by this method. When a part is complicated in shape and the contour of the shape is critical, such as that of a gear, the savings in machine time as well as acceleration in production more than justify this interesting and often necessary production method.

Experience at the Detroit Transmission Division of General Motors has proved that heat-treat distortion can be determined and controlled for critical parts. This is being done in the production of planetary gearing for automatic transmissions. For example, in the daily production of sixty-thousand planet pinions, dimensions are held within a few ten-thousandths inch.

To achieve this, the final engineering specifications after heat treating, for a pinion, Fig. 2, are studied by inspection, tool engineering and research

guare with axis within 0.0005 te ± 0.0002 m ute -0.0004 mai 45 42 394 339 0.0005 max tooth action error 30° 27 0.0015 max P.D.runout Tooth Action Diagram 21 GEAR DATA 15 Involute Tolerance

Fig. 2. Complete design specifications are necessary for setting up production controls.

GREE	N GEAR SPECIFICATIONS	Shave	
	Preshave	-0.0003 4.5 to 45 deg rol	
	± 0.0005 from 4.5 to 45 deg	-0,0007	
AVE. INVOLUTE		0.0005	
VARIATION	0.0010	50 microinches, rms	
	Scallop depth -0.0005	The same of the sa	
REQ'D. FINISH		0.0002 to 0.0004	
	None	18 to 30 deg	
CROWN			
LOC. OF TROWN	0.0000 to -0.0010	-0.0005 to -0.0008	
AVE, LEAD	0.0000 to	0. 0005 max	
	0.0010	50 microinches, rms	
VARIATION	Scallop depth 0,0005	Up to 0.00025 allowed  Center	
REQ'D FINISH	Scanop and		
	None		
CROWN	-		
LOC. OF CROWN		0.001 max	
PITCH DIA, RUNOUT	0,002 max	0.0005 tooth to tooth	
	0.0007 tooth to tooth	6. 0003 0001	
TOOTH ACTION ERROR		0.0005	
CIRC. PITCH ERROR		1, 182 to 1, 185	
CIRC. PITON 22	1, 186 to 1, 188		
SIZE	over 0. 125 balls	over 0. 125 balls	

Fig. 3. Green gear specifications show the machining dimensions to give finished size after heat treating.

departments. These experts predict heat-treat distortion and run initial tests, using experience as background. When tests indicate that the trial operations are within control, green gear specifications and charts are prepared for the production machining department giving tolerances for hobbing and shaving operations, Figs. 3 and 4.

Comparison of these specifications shows the magnitude of the adjustments for the machining operations. For example, 0.0010 inch pitch diameter runout is specified for the green gear yet the finished gear may have 0.0015-inch runout. Toothaction errors have the same limits of 0.0005 inch. Tooth-thickness size growth from 0 to 0.0005 inch is allowed during heat treatment. Involute variation from 0.0005 inch in the green condition is specified to allow for 0.0006-inch variation in the hardened gear. Lead variations for the green gear are 0.0005 inch so that the finished gear may be within 0.0008 inch. These specifications, as may be noted, provide for growth and distortion during heat treatment.

Machining: Blanks for the gears are produced on automatic screw machines which rough bore, face and turn the O.D. Transferred to an automatic boring machine, the bore and face are machined and the bore chamfered. Then a grinder rough finishes the other face. The accuracy of the blank is important because all subsequent operations depend upon it. Face runout is held within 0.0003 inch and the bore is semifinished to the same telegrapes.

Blanks are fed to a battery of automatic loading hobbing machines. These machines are also automatically adjusted for size, Fig. 5, before the gears are transferred to shaving machines, Fig. 6. To keep hobbing within control, the hobs are checked for "peel back" with a microscope. Peel back is kept within 0.020 inch. If the hob gets dull, fillets tend to climb, causing interference in gear action. When hob wear is excessive the system is out of control even though dimensions are within green tolerances. If hobbing is below standard, the shaver would be required to remove more stock. This involves excessive cold working with resulting increase in distortion and an out-of-control operation because the cold working during shaving would not be uniform.

Coolants are specified for each operation. Some machines use oil and others, soluble oil. Coolants have a definite effect on hob life. Once the coolant specification is established, it is not changed.

All setups are carefully recorded with respect to speeds, feeds and head angles. Also all diameters, sizes over balls, type of coolant, cutter life,

#### TOOL ENGINEERING



pieces per sharpening, and tooling data are recorded on one sheet for each operation. Gears are inspected for concentricity and tooth action against a master gear in a rolling fixture, Fig. 7. Also, gears are checked for size with a pair of ball micrometers. For quality control, samples are sent to the gear laboratory from all machines during the production run and each time a tool is changed.

Inspection: The gear laboratory operates as the quality-control department. Each man in the laboratory is responsible for a group of produc-

INVOLUTE

-0.0002

Min Max
-0.0005

Reference point
Tries

30

Crown not required but up to 0.00025 is permissible

0.0002

-0.0004 crown located between Is® and 30°

Reference point
Tries

30

Crown not required but up to 0.00025 is permissible

0.0002

-0.0004 crown located between Is® and 30°

Reference point
Tries

30

Crown not required but up to 0.00025 is permissible

0.0002

-0.0005

No hollow teeth

S.A.P 45°

Max rooth to 0.001
Jooth error Max space Max runarror out

Fig. 4. Green gear charts show the tolerances for gear size, involute form, lead, tooth error, spacing error and runout to assure proper size and contour after heat treatment.

tion machines. Blank machining, hobbing and shaving operations are carefully controlled. If the machines are in control, the final product will be. If a machine is out of control, a red tag is attached to it. This indicates that a cutter change or machine adjustment is necessary. When a machine is tagged, the operator, foreman and job setter are informed. That machine can not go back into production until the laboratory releases it.

Each gear sent to the laboratory is hand rolled to check concentricity and tooth action. Also, ball micrometers are used to inspect gear size. The involute form is checked with a recording instrument, Fig. 1. A chart is made for a composite check, Fig. 8, for the combined effect of concentricity, involute form, lead and spacing. The main objective in this laboratory is to keep all machines in rigid control. With that accomplished the finished gears will be within tolerance if the material and heat treatment are within specifications.

Control charts are kept for each machine and shift operator. A green signal indicates the machine is performing satisfactorily; yellow shows passable performance and red indicates the machine out of control. After heat treat, a percentage of the gears are inspected against design specifications to assure accuracy of parts as well as control of heat treat.



Fig. 5. Automatic sizing device checks preshave size of parts after leaving hobbing machine.

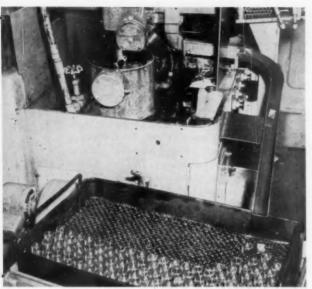


Fig. 6. Rotary diagonal underpass shaving machine automatically loads and unloads the pinions.

This final inspection verifies over-all process control and green gear specifications.

This laboratory also checks test runs for design changes and new designs. It is possible to predict heat-treat distortion and size change from the first test gear by checking the same tooth before and after heat treatment.

Heat Treatment: Steels for the planet pinions are two types, SAE 5140-H for small pinions and 5145-H for larger pinions. The increased carbon content of the latter gives better hardening throughout because the pinion has a larger mass in the hub section.

As-received stock specifications require that the material be 5-8 on the McQuaid-Ehn grain-size specification chart. Microstructure is controlled to have a uniform blocky form of open lamellar pearlite and ferrite with some fine unresolved pearlite. Brinell hardness of 187 to 207 is specified so that proper finish on the gear teeth is obtained at the hobbing operation.

All new lots of steel are analyzed before being released to production. As a safeguard, a sample lot of gears is machined, checked in the green state, heat treated and final checked before any lot of steel is released to production. If any adjustments in the green specifications are necessary, they are made at this time so that the final gears will be within design specifications.

Gears are treated in an automatic, pusher type, tray-unit furnace, Fig. 9, consisting of a controlled-



Fig. 7. Gear rolling fixture provides a production check for pitch diameter runout.

atmosphere hardening furnace, quench unit, washing machine and recirculated-air tempering furnace. The hardening furnace is a gas-fired, radiant-tube controlled-atmosphere unit having three heat zones, 1450, 1525 and 1500 F. Atmosphere is an endother-mic-generator gas flowing at a rate of 900 cu ft per hr with natural gas as a carburizing agent flowing at 50 cu ft per hr. The push cycle is controlled to give two-hour time in the furnace. This provides complete solution and proper case depth as well as best control of the process.

After austenitizing and acquiring the desired case depth, the parts are quenched in hot oil at 325 F. This hot oil quench was established to minimize distortion of the tooth form and bore. SAE 100 aircraft engine oil was selected after considerable experimentation seeking the economically best medium. For this application salt is not as satisfactory as oil. Oil gives the best quenching properties with minimum distortion and reasonable cost for this operation.

Parts are quenched for 3 min. to assure uniform temperature throughout. After quenching, the parts cool in air. Approximately one hour is required for cooling to room temperature so that transformation to martensite will be uniform and complete. This

#### TOOL ENGINEERING (in Action)





method is a modified marquench process.

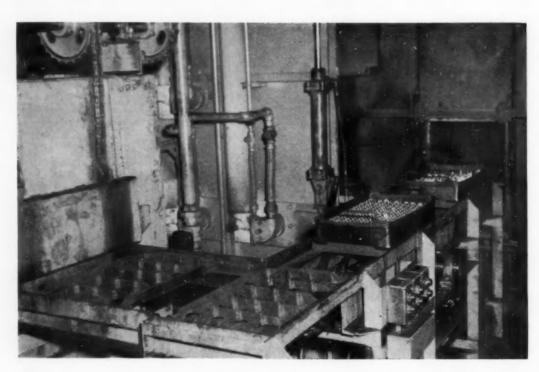
Before tempering, the parts are automatically washed. They are then tempered at 375 F for one hour to produce the required hardness and to relieve quenching stresses. Specifications call for a hardness of 50 to 56 Rc to give good impact and load carrying properties for the application. The case depth of 0.005 to 0.010 inch adds to the wear properties of the teeth and bore.

Micrographs of the heat-treated pinion are made in the laboratory as a control check. Microstructure of the core is medium-fine, tempered, acicular martensite with no free ferrite. The case is fine tempered acicular martensite with fine, pinpoint, scattered, nonconnected carbides.

Close control of manufacturing is important to assure satisfactory operation of a planetary set. This, with the proper design, proper materials and comprehensive inspection, provides for long and quiet operation of the component in service. The same principles for control may be applied to advantage in many production operations, resulting in a more uniform product with dependable performance. These can be obtained economically.

Fig. 8. (left) Composite check for measuring the effect of concentricity, involute form, lead and spacing errors.

Fig. 9. (below) Trays loaded with pinions ready to enter pusher type furnace.



## estimating construction costs for tools, dies, gages and machines

By Ross E. Quinlan\* Consulting Engineer Little Rock, Arkansas

Accurate determination of the construction costs for tools, dies, gages and machines is of primary importance to tool builders for the purpose of developing quotations and to product manufacturers for planning purposes. Because of the complexity of the many factors which must be considered and the time required for calculation, available systems and methods for estimating construction costs are not generally used.

Construction costs can be readily estimated through the use of the accompanying tables. Each tool detail or assembly is analyzed to determine the operations required for its production. Time values for each operation are selected from the appropriate tables and these values are added together to obtain the total time required to produce the detail or assembly.

Allowances are included in all chart values for 60 percent operator efficiency. For lower rates of efficiency suitable adjustments in the time values can

Cutoff, Forming and Welding Operations

Chart	1-4	Cutoff

Saw Cut—for each 2" of material thickness allo Torch Cut—for each 25" of length cut allow	
Chart 2—Forming (bending)	
Sheet or Strip-for each hand allow	0.3 hr

	Plate	or	Bar-for	each	bend	allow	
Char	1 3-	_v	Velding				

Char	1 3	-weidii	18		_	_				_
	All	Types—for	each	6"	of	weld	allow	 	0.1	hr

<sup>&</sup>lt;sup>2</sup>Senior member ASTE Little Rock Chapter.

be made by the estimator. Setup times allow ample time for gathering tools, preparatory setup, teardown, conditioning of tools, disposition of tools and cleaning the workplace.

Average speeds and feeds for free-cutting materials (FCM), oil-hardening tool steel (OHTS) and high-alloy tool steel (HATS) have been used in developing the time values for machining operations. The small amount of machining time required

#### Superficial Machining Operations

Chart 4-Clean up and Square (Mill or Shaper)

Surface Area (square	M	chining Time (h (Including setu	
inches)	FCM	OHTS	HATS
6	0.318	0.344	0.356
16	0.412	0.465	0.488
30	0.518	0.606	0.744
48	0.639	0.773	0.830
70	0.740	0.905	0.976
98	0.924	1.179	1.288
126	1.077	1.400	1.538
160	1.248	1.651	1.824
198	1.361	1.804	1.944

to perform a given operation relative to the time required for setup has made it possible to use large increments of work size and also permits application, without interpolation, of charted time values for the work size next larger than the calculated size without loss of accuracy.

All grinding operations, and machining operations in which the depth of cut does not exceed one eighth inch, are classified as superficial operations, Charts 4 through 9, and the surface area or diameter of the work is used in estimating machining time values. For machining operations in which the depth of cut exceeds one eighth inch, Charts 10 through 15, the volume of material removed is used in determining machining times.

Setup-time values for drilling, reaming, counterboring, jig boring, jig grinding and tapping, Charts

Chart 5-Surface Grinding

Surface Area (square inches)	Machining Time (hours) (Including setup)
6	0.207
16	0.344
30	0.529
48	0.757
70	1.028
98	1.363
126	1.706
160	2.099
198	2.564

12, 13 and 14, are applied once for each pattern of holes of the same size range that can be machined in the same setup. Machining time values are applied in multiples of the number of holes in each pattern. These time values and the value for lathe boring, Chart 15, are calculated in increments of length or depth for average work. For lengths or depths greater than those shown on the appropriate charts the charted values are applied in multiples of length or depth specified in the chart headings.

Time values for bench operations, Charts 16 through 20, are applied independently of the time values in preceding charts.

Chart 6-Internal Grinding

Hole Size (inches)	Setup Time (hour)	Time for Machining 3 Diam Depth (hours)
1	0.280	0.147
2	0.336	0.585
3	0.392	1.318
4	0.448	2.346
5	0.504	3.666
6	0.560	5.280

The method of estimating the time required to fabricate an individual die detail is show in Example 1. To estimate the total construction time required for a complete tool, the times required to construct individual details are added to the times required for bench operations and tryout. A summary sheet, Example 2, can be used to record all time values in convenient form.

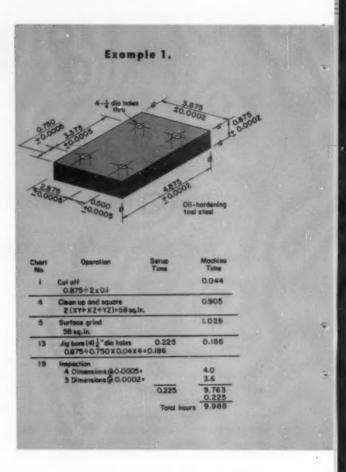


Chart 7-Turning and Facing

Outside Dia	Setup Time	Machining	Time Per In. (hour)	of Length
(inches)	(hour)	FCM	OHTS	HATS
1	0.336	0.027	0.046	0.054
2	0.392	0.042	0.073	0.084
3	0.448	0.051	0.087	0.102
4	0.504	0.055	0.094	0.110
5	0.560	0.060	0.102	0.120
6	0.616	0.060	0.102	0.120
8	0.672	0.069	0.117	0.138
10	0.728	0.074	0.126	0.148
12	0.784	0.084	0.143	0.168

Chart 8-Cylindrical Grinding

Outside Dia (inches)	Setup Time (hour)	Time per Incl of Length (hour)
1	0.100	0.048
2	0.117	0.096
3	0.133	0.146
4	0.150	0.194
5	0.167	0.244
6	0.183	0.293

Chart 9-Lathe Threading

Outside Dia	Setup Time	Time per Inch
(inch)	(hour)	(hour)
To I	0.336	0.007

Major Machining Operations

Chart 10-Milling, Shaping and Lathe Operations

Material Removed	Total Machining Time (hours) (Including setup)		
(cubic inches)	FCM	OHTS	HATS
1	0.335	0.346	0.351
2	0.382	0.405	0.416
3	0.430	0.464	0.477
. 4	0.479	0.525	0.545
5	0.516	0.574	0.600
6	0.554	0.624	0.654
7	0.592	0.674	0.708
8	0.692	0.752	0.763
10	0.701	0.817	0.868
12	0.769	0.909	0.969
14	0.836	0.999	1.070
16	0.905	1.091	1.172
20	1.021	1.254	1.355
25	1.157	1.449	1.573
30	1.332	1.682	1.832
40	1.591	1.888	2.257

Chart 11-Rough Milling Contours from Solid

Material Removed	Total Machining Time (hours) (Including setup)		
(cubic inches)	FCM	OHTS	HATS
1	0.467	0.607	0.667
2	0.681	0.961	1.081
3	0.894	1.314	1.494
4	1.108	1.668	1.908
5	1.332	2.022	2.322
6	1.536	2.376	2.736
7	1.749	2.729	3.149
8	1.963	3.083	3.563
10	2.391	3.791	4.391
12	2.818	4.498	5.218
14	3.245	5.205	6.045
16	3.673	5.903	6.873
20	4.528	7.328	8.528
25	5.596	9.096	10.596
30	6.665	10.865	12.665
40	8.803	14.403	16.803

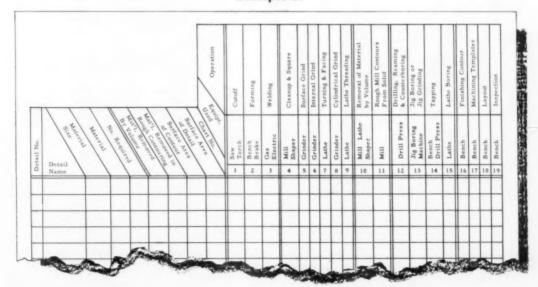
Note: Values on this chart are applicable only to rough end-milling of inside closed-contour shapes from solid.

Penetrating Machining Operations

Chart 12-Drilling Reaming and Counterboring

Hole Dia	Setup Time (hour)	Time for Machining 3 Diam Depth (hour)
1/6	0.100	0.002
3/4	0.125	0.004
3/2	0.150	0.007
1	0.175	0.014

Example 2.



#### REFERENCE SHEETS

Chart 13-Jig Boring and Jig Grinding

Hole Dia	Setup Time (hour)	Time for Machining 3 Diam Depth (hour)
3/4	0.200	0.020
1/4	0.225	0.040
3/2	0.250	0.070
1	0.275	0.140

Chart 14—Tapping

Tap Size (inch)	Setup Time (hour)	Time for Tapping 2 Diam Depth (hour)
1/4	0.100	0.022
34	0.125	0.022
3/2	0.150	0.018
3	0.175	0.018

Chart 15-Lathe Boring

Hole Dia.	Setup Time	Machining	Time per In.	of Length
(inches)	(hour)	FCM	OHTS	HATS
1	0.280	0.034	0.058	0.068
2	0.336	0.117	0.199	0.235
.3	0.392	0.166	0.283	0.333
4	0.448	0.201	0.342	0.403
5	0.504	0.228	0.388	0.456
6	0.560	0.250	0.425	0.500
4	0.616	0.309	0.526	0.618
10	0.672	0.382	0.661	0.766
12	0.728	0.485	-0.825	0.970

#### **Bench and Tryout Operations**

Chart 16—Finishing Contours

Contour Surface		Setup Time	
(square inches)		(hour)	
1	4	0.216	
2		0.240	
3		0.253	
4		0.267	
5		0.281	
6		0.294	
7		0.308	
8		0.322	
10		0.349	
12		0.376	
14		0.404	
16		0.431	
20		0.486	
25		0.555	
30		0.624	
40		0.761	

Note: Total machining time in hours equals sum of time values from Charts 11, 18 and 19 divided by 4.

Chart 17-Machining Templates

Allowance (hours)
0.0666 0.1322 0.1998
0.2664 0.3330 0.3996
0.4662 0.5328 0.6660
0.7792 0.9342 1.0656
1.3320 1.6640 1.9980

Note: Total machining time in hours equals template machining time allowance multiplied by total layout time.

Chart 18—Layout Time

Lines															1	Γi	n	10	Allowanc hours)
Straight																			 0.5
Curved																			 1.5

Note: Do not allow layout time for curved lines which are portions of circles that can be machined with circular cutting tools, boring heads or by turning.

Chart 19—Inspection

Total Dimensional Tolerance (inch)	Time Allowance (hours)
0.0100	0.2
0.0050	0.4
0.0020	0.6
0.0010	0.8
0.0004	1.0
0.0002	1.2
0.0001	1.4

Chart 20—Assemble and Try Out

Total Time		Time	Values	from	Charts	16,	18	and	19
(Hours)	-				2.4				

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#### ASTE OFFICERS FOR 1956-57

This "family portrait" was taken immediately after the election of the Society's 1956-57 officers by the Board. Seated at the table from left are: Wayne Ewing, third vice president; Howard C. McMillen, president; Harold E. Collins, first vice president; and George A. Goodwin, second vice president. Over their shoulders are: Retiring President Harry B. Osborn, Jr.; William Moreland, secretary; and H. Dale Long, fourth vice president. John X. Ryneska, newly elected treasurer, was delayed by Eastern snowstorms and unavoidably absent.



May 1956

#### Howard C. McMillen

President, 1956-57

#### THE AMERICAN SOCIETY OF TOOL ENGINEERS

Mr. McMillen, newly elected head of ASTE, became the Society's 25th president when he was sworn into office at the 1956 annual meeting in Chicago. With dual responsibility, he will also serve as chairman of the Board of Directors for the coming year.

Having wide executive experience in the refrigerating industry, Mr. McMillen joined Philco Corp. in 1951 as plant manager for the factory in Bedford, Ind. He organized, equipped and laid out the plant, and has since been in charge of the entire operation. Mr. McMillen had been general superintendent of Seeger Refrigerator Co. in Evansville, Ind., prior to his appointment with Philco.

A graduate of Purdue University with a B. S. M. E. degree, he is a registered professional engineer in Indiana. Senior member since 1938 and charter chairman of the Evansville ASTE chapter, Mr. McMillen is also listed as past chairman of the Dayton chapter of which he was a member for many years.

Nationally, he has served the Society as vice president and national director since 1953, national treasurer for two terms and chairman of the National Finance Committee from 1949-51. Mr. McMillen also holds membership in the American Society of Refrigeration Engineers.

Playing an active role in Bedford community affairs, he is a member of the Chamber of Commerce board of directors, vice president of Community Chest's board of directors, and member of the Rotary. Recently Mr. McMillen was appointed member of the Personnel and Labor Relations Committee of the Indiana State Chamber of Commerce.

When Mr. McMillen finds some of that rare spare time, he indulges in his hobbies of color slide photography, golf and bridge.

But most of all he enjoys spending his "off hours" with his wife and two sons, Earl and John, 22 and 19. Earl, now serving as a second lieutenant in the U. S. Army, and John were both charter members of the Purdue Student Chapter of ASTE. John, now chapter treasurer, is a sophomore in electrical engineering. Earl was graduated from Purdue with a B.S.M.E. in June of 1955.





Mayor Richard J. Daley, far right, welcomes 1955-56 President H. B. Osborn, Jr., and other national officers to Chicago to open the 1956 ASTE Industrial Exposition. Standing by are, from left: 1955-56 Secretary J. X. Ryneska and Vice Presidents H. E. Collins and Wayne Ewing.

Victory smiles flash as ASTE's 1956-57 national officers join in a handelasp following their election by the Board of Directors. From left they are: H. Dale Long, fourth vice president; William Moreland, secretary; Howard C. McMillen, president; Harold E. Collins, first vice president; Dr. Harry B. Osborn, Jr., retiring president; George A. Goodwin, second vice president; and Wayne Ewing, third vice president. Missing is Treasurer John X. Ryneska.



#### ASTE's Convention and Exposition Called 'BEST EVER'

Writing another chapter in its book of recordbreaking successes, ASTE held its 1956 Convention and Exposition in Chicago the week of March 19-23.

Proclaimed the biggest in Society history, the Exposition boasted 535 exhibitors who demonstrated millions of dollars worth of production equipment and manufacturing processes. Total display area utilized in the Amphitheatre was 71/2 acres.

Attendance broke all previous records with the registration figure for the week hitting 36,601.

Industrial conferences, held in conjunction with the exposition, saw more than 60 technical papers presented by top experts. Newest scientific and technical developments were revealed to the more than 5,000 who attended the sessions,

Enthusiasm proved high for the Shaped Diamond Tool Symposium, co-sponsored with the Society by Armour Research Foundation of the Illinois Institute of Technology. The symposium included 13 papers prepared by world-wide authorities (see page

Tours of local industrial plants maintained their ever-popular appeal with sellouts listed for all 12 inspection visits arranged by the Chicago Host Committee for convention-goers,

In addition to exposition activities, ASTE's na-

tional officers, directors, committe chairmen and delegates concerned themselves with all phases of Society operation.

The Board of Directors reviewed annual reports of all national committees, laid plans for the coming vear and elected the 1956-57 officers.

Serving will be: Howard C. McMillen, president; Harold E. Collins, first vice president; George A. Goodwin, second vice president; Wayne Ewing, third vice president; H. Dale Long, fourth vice president; John X. Ryneska, treasurer; and William Moreland, secretary.

Raymond C. W. Peterson, third vice president for 1955-56, withdrew from the national scene on orders of his physician.

Taking a stride toward meeting the country's growing shortage of engineers and scientists, President Harry B. Osborn, Jr., proposed a plan to the Board. Dr. Osborn's program calls for establishing a centralized organization, singly powerful, which may be known as the "American Foundation for Science and Engineering."

Its purpose would be encouraging young Americans to take up careers in the engineering and science fields. Widely backed by industry and educa-(Continued on next page)

rad, Wayne Ewing and H. D. Long. Standing left to right are: C. M. Smillie, R. A. Smith, W. A. Thomas,

The past year's activities were reviewed and future plans laid at the annual Board of Directors meeting J. P. Crosby, William Moreland, W. G. Ehrhardt, A. in Chicago. From left are, seated: A. R. Putnam, H. E. Collins, H. C. McMillen, H. B. Osborn, H. E. Con-B. Clark, J. O. Horne and G. A. Goodwin.





Past President W. F. Wagner, chairman of the Honor Awards Committee, greets J. F. Smithson, who accepted the Progress Award for James H. Kindelberger, chief executive officer of North American Aviation, Inc.



Life Member Edward W. Ernst, who received the Joseph A. Siegel Memorial Award, chats with Mrs. Ernst, left, and Mrs. Harry E. Conrad, wife of the Society's executive secretary.



tion in effort and money, some of its activities would include: making grants to colleges and universities for expanding facilities; providing scholarships in higher education; and reaching down into the elementary grade levels to single out and encourage boys and girls with the necessary aptitudes for science and engineering careers.

National delegates met for their annual conference and discussed ways of acquainting industry and education with ASTE's important role as a technical society.

In the closed House of Delegates session, the group elected fourteen candidates to the ASTE Board of Directors.

The Board of Directors, chairmaned by Howard McMillen, national president, will include: John X. Ryneska, G. Ben Berlien, Irving H. Buck, Philip R. Marsilius, Joseph L. Petz and Leslie C. Seager, all new members.

Incumbent directors elected to serve another term are: George A. Goodwin, William Moreland, Charles M. Smillie and William A. Thomas, H. Dale Long, Harold E. Collins, Wayne Ewing, and Harry B. Osborn, Jr., as retiring presidents.

Highlight of the ASTE convention week was the annual membership banquet held March 22 in the Grand Ballroom of the Conrad Hilton.

Past Directors Thomas J. Donovan, Jr., and Ben J. Hazewinkel were awarded pins for their service to to the Society by 1955-56 President Osborn.

The banquet program included Honor Award presentations, installation of officers and an address by David Swan, director of research at Electric Metallurgical Co., a division of Union Carbide and Carbon Corp.

Lower left, President Osborn, left, presents the ASTE Gold Medal and plaque to Prof. Orlan W. Boston, chairman of the production engineering department of the University of Michigan.

Below, Past President D. D. Burnside, Honor Awards Committee member, discusses the ASTE Engineering Citation with its winner, Ralph E. Cross, executive vice president of The Cross Co.







Upper left, several ASTE national committee chairmen and their wives enjoy the festivities at the annual banquet at the Conrad Hilton Hotel.

Upper right, David Swan, banquet speaker, delivers the keynote address on "The Impact of Industrial Research on the Standard of Living".

Recipients of the ASTE Gold Medals were: James H. Kindelberger, ASTE Progress Award; Ralph E. Cross, ASTE Engineering Citation; Orlan W. Boston, ASTE Gold Medal; and Edward W. Ernst, Joseph A. Siegel Memorial Award.

President-elect Howard C. McMillen announced national committee appointments for the coming year at the banquet.

Serving will be: Francis J. Sehn, Book; Vincent M. Spahr, Constitution and Bylaws; G. Ben Berlien, Editorial; Robert E. McKee, Education; Frank J. Hausfeld, Jr., Finance; James R. Weaver, Honor Awards; T. Bert Carpenter, Judicial; H. Verne Loeppert, Membership; Verne H. Gallichotte, Professional Engineering; Edmund Hollingsworth, Program; Wilfred B. Wells, Public Relations; John E. Rotchford, Standards; and Robert B. Douglas, Research. Dr. Harry Osborn will head up the Progress Committee.

Climaxing a week of convention activity, the Educators' Conference was held on March 23. Sponsored by the ASTE National Education Committee, it attracted industrial training directors and engineering educators from all over the country.

Keen interest was shown in the announcement of results of two surveys conducted by the ASTE Education Committee. An article in this issue by Robert E. McKee, Education Committee chairman, gives summarizes the findings. See "Where Engineers Serve Industry" on page 116.



Another group of national committee personalities and their wives dine together at the annual membership banquet.



Retiring President Osborn and his wife chat with President and Mrs. McMillen during the president's reception which preceded the banquet.

#### delegates convene

SE OF DELEGA FETING DO P.M.

> Miss Faye LaRoue of ASTE National Headquarters checks credentials of House of Delegates members for the closed afternoon session.

Meeting for their annual conference, ASTE'S National Delegates launched a 12-month plan, devised by the Society's national officers to increase the prestige of ASTE and tool engineering.

The morning conference, part of a full day of activities for Delegates, was held March 22 at Chicago's Palmer House.

The day was led off with the President's Breakfast for National Delegates which gave national officers, directors and candidates for the Board of Directors a chance to meet and get acquainted with the chapter representatives.

Asking the Delegates for their thinking and guidance, President Harry B. Osborn, Jr., opened the

The 12-month plan, introduced by means of a sound-slide film presentation, was narrated by Allan R. Putnam, ASTE assistant executive secretary, and Alan Cobleigh of The Tool Engineer staff.

The plan involves a stepped-up program at the chapter level for informing industrial management about the importance of tool engineering; making engineering educators aware of what tool engineering is and why industry needs formally trained tool engineers; and showing both industry and education what ASTE stands for.

One portion of the meeting was set aside for Delegates to break up into smaller study groups and bring forth ideas for implementing the plan. A challenge for immediate action went home to each chapter with its delegate.

During the afternoon, the annual meeting of the House of Delegates convened in closed session to elect the 1956-57 Board of Directors. Elected chairman of this year's House of Delegates session was O. J. Onken, Chicago chapter's delegate.



President Osborn, at microphone, addresses delegates at the breakfast in their honor which led off a full day of activities. Sitting with the delegates are national officers Conrad Smillie and Long.



President McMillen greets Irma Potter of Centinela Valley, the Society's only woman delegate.

Delegates mingle with directors and director candidates at the breakfast. This group includes Director G. A. Goodwin and G. B. Berlien, who was elected to the Board later in the day.

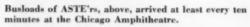


Candidates for Board of Directors line up to be introduced at the President's breakfast for delegates.



#### exposition candids





Pictured at the left is but a small segment of the thousands who registered for the Exposition.

A typical Exposition scene, lower left, reveals convention-goers making the rounds in their quests for newer, better or less costly manufacturing methods.

Keen interest is reflected on the faces of this group of men, below, watching a demonstration of precision optical tool grinding.





All conference participants attended briefings to iron out the many details of presentation. At this session were, from left: Prof. P. A. Smith, K. L. Nowak, Prof. M. C. Shaw, F. J. Daasch, Earl Hart and Chairman W. E. Carroll.





At left, a near-capacity audience listens attentively to the speaker at a technical session held at the International Amphitheatre.

#### **Technical Sessions**

Preparing for a conference on "Metal Cutting Research Applied" at this breakfast briefing were F. V. Lambertson, Chairman Carl Oxford, Jr., Prof. K. J. Trigger, Ed Hollingsworth and Prof. L. V. Colwell.



Reviewing their material before a conference on "Automation—You Can Afford It!" are: Carl Manz, Al Grove, J. B. Cunningham, Chairman Mel Burdett, Ralph Cross and Emil Houha.





## educators' conference



Above left, a last-minute consultation before the conference was held by: standing, A. R. Putnam, J. X. Ryneska and C. J. Oxford, Jr.; seated, Prof. M. L. Begeman, Chairman McKee, President McMillen and H. D. Long.

Mutual cooperation is promised by ASTE and education leaders in a friendly handshake. From left are: Prof. McKee, Mr. Oxford, Prof. O. W. Boston, President McMillen and A. O. Schmidt.

Leading engineering educators and industry training program directors from all over the country met in Chicago during convention week for an educators' conference sponsored by ASTE's National Education Committee.

Main feature of the conference was a report by Prof. Robert E. McKee, chairman, on the results of three surveys conducted by the committee. His analysis may be found in his article, "Where Engineers Serve Industry", on page 116.

In opening the conference, National ASTE President McMillen stressed the increasing necessity for higher education in the tool engineering field as its standards are raised and its scope expanded. He urged educators to give greater attention to the needs of this branch of engineering.

Educators and ASTE national officers engaged in earnest discussion at the head table of the educators' luncheon which preceded the afternoon conference at the Conrad Hilton Hotel.



# DIAMOND DISPLAY...

Paralleling the Shaped Diamond Tool Symposium co-sponsored by ASTE and the Armour Research Foundation of Illinois Institute of Technology were \$6,000,000 worth of well-guarded diamonds on exhibit at the foundation's show booth. Millions of TV viewers got a glimpse of the diamonds Monday morning on NBC's "The Home Show."

Dr. D. J. Rettaliata, institute president, was master of ceremonies at the "Diamond Dinner" which led off the symposium of 13 papers by world-wide authorities presented during convention week. The guest speaker, J. S. Gillespie, manager of the Diamond Project, Carboloy Dept. of General Electric Co., took "Man-Made Diamonds" as his topic.

At right, an NBC model flanked by armed guards, glitters with a large percentage of the "non-industrial" gem diamonds which shared the limelight with industrial and man-made diamonds in the display.



Diamond Dinner Speaker J. S. Gillespie and K. R. Beardslee, general manager of Carboloy Dept. of General Electric Co., discuss the evening's program.



Reporters and photographers press close as Sara Leonard of the Armour Research Foundation staff admires the 426-carat uncut Winston diamond, on public view for the first time at the Armour exhibit.



# other convention HIGHLIGHTS



Above, ASTE convention visitors are seen on one of the 12 plant tours arranged by the Chicago Host Committee for exposition week. This group is viewing operations at Hotpoint Co.

At the left, convention-goers and their wives met socially at the public reception held in the Conrad Hilton, just prior to the ASTE annual banquet.

A get-acquainted tea launched the social program planned for ASTE wives. Indulging in feminine conversation are, from left, Mesdames Edwin L. Cutler, Frank X. Bale, Wayne Ewing, Harry E. Conrad, Harold E. Collins, and John X. Ryneska.



Responsible for the planning of luncheons, tours and a fashion show for the ladies was the Women's Activities Committee. Heading the group were: from left, Mrs. Clark Shafer, assistant chairman; Mrs. Richard Berlimer, general chairman; and Mrs. William Haskins, reception chairman.

# Elkhart-Goshen Chartered in Indiana



Displaying the banner of the new chapter are the principal participants in the Elkhart-Goshen chartering excessions. From left; Jack English; Notre Dame's Dr. Karl Schoenhorr; Darrall Milstend; H. B. Osborn, Jr.; H. V. Loeppert; and M. J. Bunting.

With 1955-56 President Harry B. Osborn, Jr., as chartering officer, Elkhart-Goshen officially became the 131st chapter of ASTE in ceremonies held on Feb. 28 at the Elkhart, Ind., YWCA.

Toastmaster for the event was Dr. Karl Schoenherr, dean of engineering at the University of Notre Dame, who spoke on the shortage of engineers.

Officers of the 164-member Indiana chapter are: Darrell B. Milstead, chairman; Jack English, first vice chairman; L. D. Tyson, second vice chairman; Charles N. Wolf, secretary; and Charles Kelly, Jr., treasurer.

Special guests included: Wendel Decker, Elkhart Industrial Club president; E. L. Danielson and Ray Messick, mayors of Elkhart and Goshen, respectively; H. Verne Loeppert, chairman of the National Membership Committee; Marvin J. Bunting, staff administrator from ASTE National Headquarters in Detroit; and representatives of the South Bend and Calumet Area chapters.

# First California Student Chapter

The Society's twelfth student chapter, its first on the West Coast, was chartered Feb. 15 at California State Polytechnic College, San Luis Obispo. National Vice President Wayne Ewing presented the charter to Chairman Don Bowden.

Prof. Frederick Preator, ASTE National Education Committee member and head of the Tool Engineering Department of Utah State Agricultural College, spoke on "Our Place in Engineering."

The chartering was the culmination of the com-

bined efforts of Los Angeles chapter through its Education Committee Chairman George C. Adams and Prof. Francis F. Whiting of the college.

Representing Los Angeles chapter were Frank X. Bale, first vice chairman; Mr. Adams; Alfred E. Beaumont, National Membership committeeman; and Paul Burt, professional engineering chairman. Also present were Ed Cutler, past chairman of San Gabriel chapter; and Dean H. P. Hayes of the engineering faculty of California Polytech.

California State Polytechnic College chapter members pose after chartering ceremonies. Seated in front are the officers: from left, John Wilkin, secretary; Jay Beard, second vice chairman; Don Bowden, chairman; Jackson DeMuth, first vice chairman; and John McKune, treasurer. Standing at left is Prof. Francis F. Whiting, chapter advisor.



# ASTE, NAM to Sponsor Course June 10-15 at Penn State University

An intensive week-long course on automation, covering the important aspects of planning and tooling for automation, will be held June 10-15 at Pennsylvania State University.

Co-sponsored by ASTE and the National Association of Manufacturers, it will be directed by Prof. Chester Linsky, chairman of the university's Indus-

trial Engineering Dept.

The program will stress the practical approach to automation, showing the step-by-step methods used to take a product through the stages of design, planning and tool design to tie together a system for low-cost automated production, taking into account limited tooling budget and flexible production requirements.

Half the week will be devoted to six workshops conducted by automation en-

gineering which will give those attending a chance to work with automation equipment and solve practical design and application problems.

Among the speakers will be Dr. Harry B. Osborn, Jr., 1955-56 ASTE president and technical director, Tocco Division, Ohio Crankshaft Co.; P. H. Alspach, manager, Equipment Development and Construction Manufacturing Services Div., General Electric Co.; and Marshall G. Munce, NAM director and vice president, The York Corp.

The registration fee of \$50 will cover all expenses of the course and workshops and should be sent to: T. Reed Ferguson, Director, Conference Extension Center, Pennsylvania State University, University Park, Pa. On-campus housing and eating facilities are available for conferees.

# Fairfield Chapter Chooses New Officers

Fairfield County chapter elected officers for the coming year at its Feb. 1 meeting at the Hitching Post Inn, Bridgeport. Elected were: Eugene Laistner, chairman; Frank Moriarity, first vice chairman; Norris W. Green, second vice chairman; Henry E. Busby, secretary; Richard C. Prentice, treasurer.

Morris S. Shipley, president of Esbec Barrel Finishing Corp., spoke on "Cutting Costs — Improving Quality with Modern Barrel Finishing" to the 85 members present. — Henry E. Busby

# Monmouth Re-elects J. L. Webster Chairman

Election of officers and a movie titled "Operation Pushbutton" high-lighted the Feb. 21 Monmouth meeting.

The incumbent officers were reelected, and included: John L. Webster, chairman and delegate; Laurence H. Seibert, first vice chairman and alternate; W. William Halbrook, second vice chairman; Erick L. Hanson, secretary; and Vincent G. Jarman, treasurer.

The film was shown by Hale S. Cadieux, district manager of The Bellows Co. —Harry A. Williamson



A recent meeting of the 1955-56 National Membership Committee, held at the Jefferson Hotel in St. Louis, boasted perfect attendance with a representative from each area. Starting at the six-o'clock position and going around clockwise, are: I. H. Buck, vice chairman; E. P. Huchzermeier; E. A. Byro; W. W. Schug; Carl Hoffman; Sam Grasso; Carl Kertesz; M. J. Bunting, staff administrator; H. V. Loeppert, chairman; H. C. McMillen, national vice president and director for 1955-56; L. H. Cook; G. H. Churchill; E. E. Lull; C. A. Darger; O. E. Jost; F. J. McArthur; F. A. Flannery; R. W. Miller; and W. J. Potthoff of the National Book Committee.

# Variety of Programs Highlights Recent Chapter Activities

ASTE's national president for 1955-56, Harry B. Osborn, Jr., was the featured speaker at **Baltimore** chapter's election meeting. Technical director of Tocco Div., Ohio Crankshaft Co., Dr. Osborn covered many phases of induction hearing.

A special program for the ladies was on the February agenda for Chautau-qua-Warren members. Dinner and entertainment for close to 100 persons were the top attractions. Another meeting, following more technical lines, offered a talk on "Current Ideas about Grinding." Dr. Leo P. Tarasov, research and development engineer for Norton Co., was the speaker.

The worst blizzard of the season didn't stop 45 hardy members of Southeastern Massachusetts chapter from going to the Jan. 17 meeting. Even so, attendance for the presentation on carbides, given by Malcolm F. Judkins, manager of the New Products Div., Firth Sterling, Inc., was less than half of that anticipated. Mr. Judkins also addressed a recent meeting of Detroit chapter.

"Impact Grinding" was the topic of Ralph M. Moschella when he addressed a meeting of **Mohawk Valley** chapter. Manager of sonic products at Raytheon Mfg. Co.

Slides and the motion picture "Yankee Toolmaker" were viewed by Cincinnati members at a meeting addressed by Raymond O. Hungerford, district sales manager for Bullard Co.,

Dr. F. W. Reichelderfer, U.S. Weather Bureau chief ,spoke on "What We Are Doing About the Weather" at a combined meeting with the Technical and Scientific Societies Council of Cincinnati.

Close to 50 Oklahoma City members were on hand to hear a talk on broaching practices delivered by Joseph A. Psenka, field engineer for National Broach & Machine Co.

Speaker at a recent meeting of the Kansas City ASTE chapter was J. B. Graef, sales manager for the engine section of Westinghouse Electric Co. "Instruments for Industrial Automation" was the title of the program given in February for members of the Kansas University student chapter. Importance of automation and its impact on today's economy were outlined by Eugene Shapiro, field engineer for Lee Mark associates.

(Continued on next page)

# **Chapter Activities**

(Continued)

DoAll Company's exhibit "Civilization through Tools" recently completed a tour of western chapters, including meetings of Centinela Valley, Golden Gate, Los Angeles, San Gabriel Valley and San Fernando Valley. The stopover at Albuquerque, N. M. was the occasion of afternoon and evening sessions.

Responsibilities shouldered by today's United States Air Force were discussed at another meeting of Albuquerque chapter. Using a film as illustration, Lt. Col. Walter J. Atkins, USAF, explained how the various commands stand in constant readiness to defend the nation on all fronts.

A plant tour was on the ASTE agenda for Williamsport members who were guests of Piper Aircraft Corp. at Lockhaven, Pa. Brief talks on how Piper airplanes are built were given at dinner by Mike Reinwald, supervisor of the production department, and William Englert, supervisor of sales. On Feb. 13 the chapter heard a talk on "Industry for Williamsport" by Roland H. Dunn, local industrial commissioner.

"Recent Developments in Tool and Die Steels" was the technical topic presented at a meeting of **Fort Wayne** chapter by Birger Johnson, chief research metallurgist, Latrobe Steel Co. Coffee speaker was Richard P. App. manager of the Employment Security Division.

A joint meeting with the York, Pa. chapter of ASM was on the February program for Central Pennsylvania ASTE members. A total of 156 engineers was on hand for the annual event held at Lincoln Woods Inn. W. T. Rubin, service metallurgist with Copper Weld Steel Corp., was the principal speaker. His topic was "Leaded Steels."

Nearly 100 Long Beach members met at the Petroleum Club for the Feb. 1 program on assembly tooling with magnesium. Speaking to the group was Donald M. Johnson of Dow Chemical Co., Midland, Mich. At an earlier meeting, a technical program on "Tools of Abundance" was presented by Vincent Buerge, representative for Wesson Carbide Co.

Meeting with the local chapter of the American Welding Society, **Boston** ASTE members heard Frank E. Kessler of Welding Equipment and Supply Co. discuss tool and die welding. Another speaker, Steven C. Siney, Jr., of the Massachusetts Federation of Taxpayers, gave some of the answers to the question "Where Does Our Money Go?"

(Continued on next page)

PATERSON—Brother Oscar Andrejasic, head instructor in machine shop practice at Don Bosco Technical School was presented with a membership in Paterson chapter. The chapter is giving him the membership gratis, since he has no income from the Salesian Order. From left are: John Morrow, co-chairman of the constitution and bylaws committee; Charles Winschuh, educational chairman; Brother Oscar; Robert Neeb, second vice chairman; George D'Angelo, secretary; and Rev. August Bosio, apiritual moderator of the Don Bosco Men's Club.—George D'Angelo

# Lima Chapter Picks 1956-57 Officer Slate

Officers for the coming year were elected by Lima chapter at its February meeting, with J. E. Juck named chairman and national delegate. W. E. Epley will be first vice chairman and alternate; G. E. Siferd, second vice chairman; V. M. Spahr, secretary; and Donald Cox, treasurer.

A. L. Pranses, division manufacturing engineer at Westinghouse Electric Corp., told the group that automation begins in a firm's sales department. He explained that the sales department must come up with the idea for a salable product, which design engineers must then design and manufacturing engineers must prepare to produce.

-G. Stemen

# Grand River Valley Hears Talk by Cole

At its March 2 meeting at Shep's Hall, Galt, Grand River Valley chapter heard a talk by Ken Cole, chief tool designer and assistant sales manager of N. A. Woodworth Co. and Harry Whitehall Hespeler.

Air-operated diaphragm chucks and arbors of exceptional precision were demonstrated by Mr. Cole.

Installation of officers was conducted by Gordon Hall, past chairman of Hamilton chapter.

Walter Staubitz, superintendent and tool designer of Kralinator, Ltd., was a recent speaker, with "Deep Drawing and Forming of Metal" as his topic.

-W. C. Little

# Announcement Regarding Incomplete Sets Of the 1956 ASTE Collected Papers

Attention is directed to purchasers of the 1956 ASTE Collected Papers at the Chicago Exposition: Owing to an error in binding, omission has been made of a single paper in random sets sold at the Exposition. Upon request to the address indicated below, an exchange will be made of sets not containing Paper #24T43, "Preventive Maintenance, Tools, Dies, Fixtures and Equipment" by Edward E. Griffiths, or single copies will be furnished. Write to: American Society of Tool Engineers, Technical Papers, 10700 Puritan Ave., Detroit 38, Mich.



NORTHERN MASSACHUSETTS—These officers were chosen at the chapter's meeting Feb. 21 at Gardner. They are, from left: Alvin B. Cook, chairman; George A. Stanley, second vice chairman; Roger H. Tolman, secretary; and John W. Turton, treasurer. Stuart E. Sinclair, first vice chairman and alternate, and Robert W. Huxtable, delegate, were absent. H. E. Linsley, associate editor of the American Machinist, spoke on "The Meaning of Machine Tools." At a previous meeting controlled air power was discussed by H. P. Granger of The Bellows Co.—Otto S. Nau

# C. B. DeVlieg Addresses Philadelphia Meeting

"New Arts in Jigless, Precision and Production Boring" was the subject covered Feb. 16 at the meeting of the Philadelphia ASTE chapter. Speaking to a group of nearly 140 members and guests was C. B. De Vlieg, president of De Vlieg Machine Co.

The previous month, Philadelphia members attended a Grinding Seminar on cylindrical grinding, crush grinding and centerless thread grinding. Moderator for the evening was Henry Stevenson, mechanical superintendent of SKF Industries. He was supported by a panel consisting of: W. K. Mathias and L. Render, manager and assistant manager of sales for Cincinnati Milling Machine Co.; J. C. Wilson, chief engineer and sales manager at Thompson Grinder Co.; and C. W. Hopkins, chief engineer at Landis Machine Co.

The closing part of the program was devoted to questions directed to panel members.

-Sidney A. Matthews

# Springfield, Mass. Elects New Officers

The annual election of Springfield, Mass., chapter resulted in the following slate of officers for 1956-57: Kenneth R. Blaisdell, chairman; Robert W. Marquiss, first vice chairman; George H. Foy, second vice chairman; Abraham C. Nader, treasurer; Allen M. Johnson, secretary.

Speakers at another recent meeting were Carl G. Johnson, associate professor at Worcester Polytechnic Institute, and Mr. Marquiss.

### **Positions Available**

CARBIDE TOOL ENGINEERS—senior engineer to head product design and machinability laboratory.

DESIGN ENGINEER—for carbide-tipped mining tools.

Write to Vascoloy-Ramet Corp., 800 Market St., Waukegan, III.

SALES ENGINEERS AND DEVELOP-MENT ENGINEERS—long-established contral New England machine tool manufacturer has openings for sales proposal and development engineers. Sound opportunities for men with engineering background, experienced in machine tools or closely allied fields. Salaries open; advancement dependent on demonstrated ability. Liberal vacation and benefit program provided. For further information, send complete details of background to Box #063, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TOOL DESIGNERS—several positions open for senior tool designers and tool designers and tool designers with close tolerance aircraft tool designing experience. A minimum of 4 years' experience required. Salary will be commensurate with experience. Please write air mail, giving details of experience, education and home address. If now employed, indicate whether application is to be confidential. Relocation expenses paid. Write to Employment Manager, Bendix Aviation Corp., Kansas City Division, P. O. Box 1159, Kansas City, Mo.

# **Chapter Activities**

(Continued from previous page)

A plant tour held Jan. 17 for members of the South Bend chapter, attracted more than 200 members and guests. The group observed the manufacture of stationary and portable air compressors and well-drilling equipment. Host for the tour was A. R. Kessell, works manager for the Joy Mfg. Co.

At an earlier South Bend meeting, two University of Notre Dame football personalities were guests of the chapter. Johnny Druze, end coach for the Notre Dame team, and Bob Scannell, varsity end in 1955, showed movies of the 1955 season's highlights.

Physical characteristics of atomic plants were covered in a talk on "Atomic Energy and Power Generation" at a recent meeting of Santa Clara Valley members. Their speaker was Burnes E. Woodward, instrumentation engineer for the Commonwealth-Edison project, atomic power equipment department, General Electric Co.

Members of the Monadnock chapter at Keene, N. H., got the answers to the question "What is a Silicone?" at their February meeting. Supplying the information was a colored motion picture narrated by James T. Duane, technical representative for Dow Corning Corp. In January the ASTE program was devoted to "Machining of Stainless Steels" with William H. Kemper of Carpenter Steel Co.

Outlining the present management system at Ford Motor Co. in his discussion of the topic "Ford Practices in Manufacturing," Harold R. Foss spoke at a recent meeting of the Rockford ASTE chapter.

A departure from the usual meeting format marked the session of Northern New Jersey chapter recently. Instead of a purely technical program, members heard a discussion of "The Position of Tool Engineering on the Educational Scene." Participating in a forum conducted by Education Chairman Anthony Cuoco were Dr. Robert W. Van Houten, president of Newark College of Engineering; and Prof. A. H. Spinner of Stevens Institute of Technology.

A motion picture entitled "Tracer Control in Action" was shown Feb. 14 at the meeting of Greater Lancaster chapter. The program was presented by Charles Spring, sales and service engineer, George Gorton Machine Co.

Heard at a meeting of Lehigh Valley chapter was James L. Huff, technical consultant, Optical Gaging Products, Inc.

(Continued on next page)

# Chapter Activities

(Continued)

Illustrated with slides, a discussion on grinding flat surfaces was presented Feb. 13 to Chicago members by D. R. Weedon, assistant manager and secretary, Blanchard Machine Co. At an earlier meeting the chapter heard a talk on methods and procedures in tube bending given by B. F. Bower, president of Pines Engineering Co., Inc.

A visit to the Inland Mfg. Div. of General Motors Corp. was made by 100 members of **Dayton** chapter.

At a joint meeting with ASM members, the North Texas chapter of ASTE attended an educational presentation produced by Westinghouse Electric Corp. Entitled "The New Age of Metallurgy," the program was narrated by R. R. LaPelle and his associates. The ASTE speaker for February was Arthur A. Coleman, production design engineer at Chance Vought Aircraft.

Piedmont's election meeting also included a program on broaching practice, with Joseph A. Psenka, field engineer, National Broach & Machine Co., as speaker. Members of the Raleigh-Durham subchapter heard at their technical session a talk on current production problems and close tolerance work given by David S. Wright, design engineer at Westinghouse Electric Corp.

Addressing the February session of the **St. Louis** chapter was Gilbert A. Bumann, application engineer, Century Electric Co.

Rochester's affiliate members' night provided the ideal opportunity to welcome 18 companies to the ASTE fold. Official Society affiliate membership plaques were presented to company representatives by William B. Kamola, 1955-56 chairman. Technical speaker was R. L. Gergen, gage consultant.

Problems in carrying parts through to completion in progressive dies were discussed at a **Western Michigan** session by Frank A. Brandes, Jr., secretary of Brandes Press Co.

In addition to electing new officers for the year, Western Reserve members witnessed at their February meeting a showing of the new film "Teamwork" produced for Bethlehem Steel Co. The presentation was made by Herman M. Rittger, general manager of tool steel sales, Solar Steel Co. At an earlier session, the chapter heard a talk on "Profits from Vibration Analysis on Rotating Equipment." W. Robert Melzer, sales engineer, International Research and Development Corp., was the speaker.

(Continued on next page)



SPRINGFIELD, MASS.—Retiring President Harry B. Osborn, Jr., right, talking to 1955-56 Chairman Hollis B. Moore, was technical speaker at Springfield's February meeting. Dr. Osborn, who is technical director of Tocco Div., Ohio Crankshaft Co., discussed tooling for induction heating. He also presented membership pins to 11 new chapter members.—Allen M. Johnson

# Erie Learns of Future Need for Engineers

Executives' night was observed by Erie chapter on March 7 with a program on "Meeting the Needs for Engineers in the Future." The speaker was G. Kraus, dean of engineering at Gannon College.

Retiring Chairman John August presented the chairman's pin to the new chairman, David Schuler, and in turn received the past chairman's pin from him. Leo Weiner was presented the service pin. In February Ed Boersig and A. M. Thomson of Carboloy Dept. of General Electric Co. discussed cemented oxides for cutting tools.

-D. J. Beecher

# H. Dale Long Installs Racine ASTE Officers

March 5 was officer installation and ladies' night at Racine chapter. More than 160 members and wives met at Dania Hall for cocktails and a dinner program. Retiring Chairman Robert Freres summarized the achievements of the past year, and presented the ASTE service pin to Alvin J. Michna for his work on various committees during the past several years.

ASTE Vice President H. Dale Long spoke on the duties and trusts of chapter leaders before installing the new officers. Mr. Long also asked the membership to pledge its support by attending meetings regularly and working on committees as needed.

The program also featured a talk on "The Slide Rule of Human Relations," with Max H. Forster, training director of S. C. Johnson and Sons, Inc., as speaker.

On Feb. 22 the chapter journeyed to Kenosha to visit the American Motors plant and see the Nash, Hudson and Rambler motor machining and final assembly lines. The tour was under the direction of James Vernon, program chairman, and E. Moore of American Motors' public relations staff.

Another meeting, held Feb. 6, featured a talk on honing processes given by James Klein of Barnes Drill Co. A film and a set of slides pictured various honing problems and solutions.

# H. L. Tigges to Become Machine Tool Consultant

H. L. Tigges, past president of ASTE, has announced his retirement from Baker Brothers, Inc., to enter into business for himself as consultant on machine tools.



PURDUE UNIVERSITY—Newly elected officers of this student chapter, chosen at their Feb. 16 meeting, are, from left: Neil Biteler, chairman; Richard Burge, editorial chairman; Nicholas Kurek, first vice chairman; John McMillen, treasurer; James Chrzan, program chairman; L. G. Laudenschlager, secretary; Miles Peterson, second vice chairman; Dan White, membership chairman; and Prof. O. D. Lascoe, faculty advisor. Besides making plans for 26 members to visit the ASTE Exposition in Chicago, the group heard a talk on automation as illustrated by mechanical feeders for punch presses by Fred J. Littell, president of the F. J. Littell Machine Co.—Richard Burge



BINGHAMTON—Explaining a point to chapter members after his talk is F. E. Smith, president of Perry Equipment and Engineering Co. of Erie, Pa. From left are A. Kupfrian, A. Gagne, Mr. Smith, P. Adamek and C. King. Mr. Smith spoke on the design and applications of parts feeders for automatic machines and gave examples of how to deal with odd and difficult shaped parts.—Glyn Williams



PORTLAND, ME.—Top officers for 1956-57 will be from left: Arthur L. A. Youlund, treasurer; Henry C. Hagman, secretary; Ross L. Beaulieu, chairman; Robert H. Toms, first vice chairman; and Henry R. Jolin, second vice chairman. Technical speaker at the meeting was William S. Holloway, vice president in charge of manufacturing of Madison Industries, Inc., who discussed the technique of deep hole drilling.—Robert P. Chaplin



SAN DIEGO—Members of the San Diego chapter will be led for the coming year by these officers who are: front row, Thomas Sweet, second vice chairman; and Leo Cochran, chairman. Over their shoulders are: Lou McMicken, secretary; Fred Cohenour, first vice chairman; and Harry Trout, treasurer.—Joe Noel

# Chapter Activities

(Continued from previous page)

An illustrated lecture on "Molds for the Injection Molding Process" was given at a meeting of London-St. Thomas chapter by E. J. Poli, technical service and development engineer at Dow Chemical Co.

"Education of the Tool Engineer" was the theme of Granite State's Feb. 21 meeting. The chapter was host to local mechanical arts high school teachers for a talk on education of employees by Richard B. Gray, manager of manufacturing, General Electric Co. A tour of the Somersworth, N. H., General Electric plant followed.

Various types and applications of plastics were covered in a talk by Richard Leary of E. I. du Pont de Nemours & Co. before another recent meeting.

Syracuse members learned "What May Be Expected From Investment Castings" from H. P. Gray, president of Gray-Spracuse, Inc., recently.

Frederick Nesbitt, application engineer with Sheffield Corp., spoke on modern gaging methods at a Niagara District meeting. E. H. Walker, president and general manager of McKinnon Industries. Ltd., was the coffee speaker.

Industries, Ltd., was the coffee speaker.

Springfield, Ohio, executives night meeting was highlighted by a discussion of peaceful uses of atomic energy by Dr.

H. R. Nelson, manager of the Battelle Institute physics dept.

Ann Arbor Area chapter reports 100% membership in ASTE among the toolmaker apprentices at the General Motors Transmission Plant. Methods Engineer David Peterson and Supervisor C. Cedarleaf were instrumental in achieving this record.

Manufacture of tool steels was discussed by Birger Johnson, chief research metallurgist of Latrobe Steel Co., at Little Rhody's February meeting. Members saw a film on air equipment made by The Bellows Co. at a recent technical session.

San Fernando Valley chapter heard a talk on tooling for production welding by B. R. Russell of Airline Mfg. Co at a recent program.

Decatur chapter members and their guests toured the Caterpillar Tractor Co. plant recently.

Bernard Better, director of research for Scully-Jones & Co., spoke on production tool development at Long Island chapter's February meeting.

The Don Mills, Ont., plant of International Business Machines Co., Ltd., was visited by **Toronto** chapter.

Control of motion through hydraulics was discussed by Martin Lipton of Airoyal Co. and August Kraft of Automatic Process Control at a Greater New York session.



Don Bowden, right, of Burbank, Calif., winner of Los Angeles chapter's first scholarship award, receives the congratulations of George C. Adams, chapter education chairman. A senior at California State Polytechnic College, Don is president of its newly chartered ASTE student chapter.

# Carbide Turning Discussed at Tucson

"Carbide Turning for Small and Large Lot Production" was the subject of a talk presented by Stanley Brandenburg at the Tucson chapter's Feb. 14 meeting. Mr. Brandenburg is vice-president, Sales Division, The Monarch Machine Tool Co. More than 120 attended the session.

At an earlier meeting, Tucson chapter had its speaker, Oliver M. Hanton, chief tool engineer, Mueller Brass Co., Port Huron, Mich., who gave a running commentary on different types of tooling used in forging and some of the more difficult problems.

—Joseph W. Vincent

Wentworth Reports Recent Activities

Recent meetings held by the Wentworth Institute student chapter have been planned in three different categories—tool engineering and manufacturing processes, practical knowledge of the manufacturing world, and business.

Speakers, movies and slides have covered the following subjects: grinding flat surfaces, optical measuring instruments, plastics, hydraulics, drop forging and single-point cutting tools.

Along the practical knowledge of manufacturing line, the group has heard speakers on the differences between Japanese and American manufacturing, advantages and disadvantages of labor unions, and industrial research and patents. The membership has increased from 65 to 78 at Wentworth Institute since it was chartered in October of 1955.

Six student members gave technical papers at a recent meeting, and three were awarded prizes for their subject matter and presentation. Winners were Harry K. Himmel, Edwin M. Reed and Lee C. Babb.

-Lawrence Sherman

# Bellamy Is Appointed Company Vice President

ASTE Past President L. B. Bellamy has been named vice president of Abrasive and Metal Products Co.

Mr. Bellamy, who headed the Society in 1952-53, will direct manufacturing operations of the company's subsidiaries. He was formerly general manager of operations for Sterling Grinding Wheel Co. of Tiffin, Ohio.



INDIANAPOLIS—A father-to-son presentation of the chapter chairman's pin was made by Joseph N. Huser, 1944-45 chairman, to son John Huser, newly installed chairman. Nine past chairmen were present to celebrate past chairmen's night. Art O'Sickey of Standard Tool Co. spoke on high-speed drills. At the February meeting the Carboloy Machinability Computer was demonstrated by H. Jack Siekman.

-Ted Harding

# Fond du Lac Chapter Holds Election

Unanimously accepting the slate presented by its nominating committee, the Fond du Lac chapter elected its officers at the Feb. 10 meeting. New chapter posts will be taken over by George E. West, chairman; Lynton A. Kirby, first vice chairman; Martin E. Kozak, second vice chairman; William A. Warren, secretary; AI E. Buerosse, treasurer; and Henry S. Faith, national delegate.

Speaker on the evening program was Charles Good, application engineer with the Micrometrical Mfg. Co., who spoke on "Analysis and New Developments in Surface Finish Measurement."

The January meeting featured a talk by Lawrence A. Rubin, secretary of the Mackinac Bridge Authority. He discussed the construction of the bridge, and problems encountered in starting and carrying on the project.

-Walter M. Gradolf

# Golden Gate Chapter Again Sponsors Course

For the fifth year, Colden Gate chapter has established a course in fundamental tool engineering and tool design at the Oakland Junior College, Laney Trade and Technical Division. Henry DeCoursey is the instructor and is a member of the Golden Gate chapter.

-C. B. Marker



ALFRED STATE TECH—This photograph of the ASTE student chapter will be appearing in the next edition of the school's yearbook. Recent activities of the group include a technical lecture by P. S. Given of SKF in January and a spaghetti supper at the American Legion in February.—Jo Ann Blanz



PEORIA—Field engineers for the Behr-Manning Div. of Norton Co., Harry Westlund and Verne Thorsen, presented a technical program on coated abrasives at the March 6 meeting of Peoria chapter. From left are: Harry Westlund; H. Dale Long, national treasurer of ASTE for 1955-56, who installed new officers and was coffee speaker; Ray Morford, technical chairman for the evening; Walter Ballard, chapter chairman; and Verne Thorsen.—G. W. Wieland

# Windsor Chapter Elects 1956-57 Officers

The slate presented by the nominating committee of Windsor chapter was accepted unanimously at the Feb. 13 meeting held in the Bellevue Tavern. New officers are: E. A. Clifton, chairman; W. N. Moore, first vice chairman; J. Nesbit, second vice chairman; J. Willett, secretary; A. Underwood, treasurer; S. A. Oliver, national delegate; and F. A. Ritchie, alternate delegate.

"The Use of Nuclear Energy in Metal-Cutting Research" was the subject of the technical portion of the meeting. R. T. Hook, chief metallurgist for Warner & Swasey Co., explained the research being done at his company, using radioactive isotopes.

The January meeting at Prince Edward Hotel featured a talk by Melvin D. Verson, executive assistant of the Verson Allsteel Press Co.

-F. D. Rail

# Santa Ana Valley Elects David Reichert Chairman

David Reichert was elected chairman of Santa Ana Valley chapter at its Feb. 7 meeting at the Water Wheel Restaurant in Anaheim.

Also elected for the next two years were: Douglas Small, first vice chairman; L. G. Connelly, second vice chairman; Donald McInnis, secretary; and Paul Jones, Jr., delegate.

—Homer F. Bennett

# Portland Members Visit Oregon State College

A trip to Corvallis, Ore., for a tour of engineering facilities at Oregon State College was made in February by members of the Portland ASTE chapter. Highlighting the visit was an address by George W. Gleeson, dean of the school of engineering and industrial arts, who spoke to an audience of 80 members and guests. Other features of the program included demonstrations in the high voltage laboratory by Prof. Louis Stone.

# Milwaukee Presents Special Award Pin

The special award pin for outstanding service to Milwaukee chapter was presented to Past Chairman Paul Butzin at the March 8 meeting. New officers were installed.

Committee chairmen for 1956-57, announced by Chairman Ralph W. Lund, are: Robert W. Thompson, publicity; Walter Behrend, editorial; Otto Weitkunat, advertising; Roy Radtke, education and scholarship; Ralph L. Perlewitz, professional engineering; Jack Miller, membership; James Schultz, book; Arthur Gudert, public relations; Joseph J. Ebner, industrial relations.

Other chairmen named were: S. Hintz, constitution and by-laws; Larry A. Wacker and Richard O. Bell, chapter program editors; Paul Wernicke, standards; Paul E. Butzin, historian; George Riordan, program; Richard O. Bell, entertainment; R. E. Bodendoerfer, project and photo.

Impact extrusion was explained by Norman Olsen and M. A. Ziegler, product manager and project engineer of the impact extrusion department of Aluminum Co. of America. — Walter Behrend

# Hendrick Hudson Chapter Hears Uses of Silicones

Carl Petroski, field sales engineer for General Electric Co.'s silicone division at Waterford, N. Y., was the speaker at the February meeting of Hendrick Hudson chapter.

One of the most popular current technical topics—automation—was the subject of another recent session. Presenting the program was F. Steele Blackall III, vice president of Taft-Pierce Mfg. Co. —Benet Ripin



LITTLE RHODY—Seated at the head table at the installation of officers for 1956-57 were, from left: Karl Friedland, secretary; Horace Bennett, first vice chairman; Karl G. Nowak, national program committee member; Phil Peckham, past chairman and delegate; John X. Ryneska, installing officer and national secretary for 1955-56; Paul Watelet, chairman and alternate delegate; Gilbert Stafford, second vice chairman; and Bertram Guindon, treasurer. After the installation Nowak, who is head of methods at Fenwal, Inc., spoke on "What's in the Works at Fenwal."—Richard Kilbane

# San Antonio Elects E. F. Measels, Jr.

The chairmanship of the San Antonio chapter belonged to E. F. Measels, Jr., following the Feb. 15 election held in the Gunter Hotel. Along with Mr. Measels, M. B. Berg, first vice chairman, Chester Chiodo, second vice chairman, Willard Lang, secretary, Oscar P. Wunsch, treasurer, and James A. Metcalf, national delegate, will lead the chapter for the coming year.

Sales Manager E. Leslie Hall of Chemical Development Corp., as guest technical speaker. —Stanley G. Gower

# Officers Elected by Twin Cities Chapter

The Covered Wagon Cafe was the scene of Twin Cities chapter's election meeting on Feb. 1. Taking over top chapter posts will be: Phil W. Armstrong, chairman; Norman L. Sorlie, first vice chairman; Arnold R. Lidfors, second vice chairman; Walter J. Comstock, secretary; Gerald F. Oppel, treasurer; Robert Johnson, national delegate; and Darrell L. Coacher, alternate delegate.

In addition to the technical program presented by Harry H. Jason, manager of the Midwestern Division of Carboloy Department of General Electric Co., Roger Norman Schmidt was presented with the chapter's \$100 scholarship award. Mr. Schmidt is a senior at the University of Minnesota, studying mechanical engineering.

-R. Roy Wressell

# Crosby, Waindle Take Government Positions

Two past presidents of ASTE, Joseph P. Crosby and Roger F. Waindle, have been appointed to serve sixmonth terms, without compensation, in the Business and Defense Services Administration of the Dept. of Commerce.

Mr. Crosby, who was president in 1954-55, will be director of BDSA's Metalworking Equipment Division. A native of Boston, he is vice president-sales and director of The Lapointe Machine Tool Co. of Hudson, Mass. Mr. Crosby is also a member of the National Machine Tool Builders' Association.

ASTE president during 1953-54, Mr. Waindle has been appointed chief of the castings branch, Iron and Steel Division of BDSA. He will be on loan from his positions as president of Wai-Met Engineering Co. and vice president of The Misco Corp.



WICHITA—Heading up chapter activities for the coming year will be these officers: from left, seated, F. Earl Baker, second vice chairman; Norman B. Watkins, chairman and alternate; and James H. Janson, delegate. Standing are: Ray O. Dorow, treasurer; Willard F. Rutschman, secretary; and Harold E. Shigley, third vice chairman. First Vice Chairman Paul R. Hess was unable to be present.—James H. Janson

# Metal Marking Equipment Session at Hamilton

W. A. Freeman, vice president and manager of Barnard Stamp and Stencil, Ltd., spoke on "Metal Marking Equipment" at the February meeting of Hamilton chapter. He showed slides of the machines and tools used in the manufacture of marking dies and stamps.

Members learned about flame plating with tungsten carbide at another meeting. Addressing them was W. O. Johnson of the new products department of Linde Air Products Co., a division of Union Carbide of Canada, Ltd.

-William A. Marcellus

# Kalamazoo Chapter Names C. A. Elzinga Chairman

Clarence A. Elzinga was elected chairman of Kalamazoo chapter at its February meeting, attended by 85 members and guests. Other officers for 1956-57 will be: Don W. Nance, first vice chairman; James Carl, second vice chairman; Grant E. Beilfuss, secretary; Gilbert Marion, treasurer; Glenn Rue, delegate; and Roy Romine, alterrate.

Mr. Elzinga was also voted the president's award for outstanding service. A talk on automation was given by Charles F. Hautau, chief engineer of Hautau Engineering Co.

-Theodore J. Cook



SOUTH BEND—Howard C. McMillen, national vice president for 1955-56 installed the newly elected chapter officers on Feb. 21. From left are: Paul J. Roberts, secretary; Matthew J. Nowak, first vice chairman; E. James Nelson, chairman; Mr. McMillen; Fred S. Goss, second vice chairman; and Tony Hoefle, treasurer. The technical portion of the program featured a talk by W. H. Losse, assistant plant manager, Bendix Aviator Corp., who presented a program on various missiles and systems.

-David Herring



LOS ANGELES—A double-header program, featuring a technical session on carbide tooling and a full color and sound film of last year's Indianapolis '500' Race, was in store for 200 members who attended the January meeting. Pictured here, seated from left, are: Sam Hanks, race car driver; Lujie Lesovsky, race car designer; and Vincent Buerge, Wesson Co. representative who presented the material on carbide tooling. Standing: Fred Offenhauser, manufacturer of racing engines; J. C. Agajanian, race car owner and sponsor; and Gordon Cleveland, emcee.—Roland Hamel

# Controlled Air Power Program at Calumet

A Calumet Area meeting held recently was highlighted by a film and talk on "Controlled Air Power." Technical speaker was Charles W. Bimba, field engineer for The Bellows Co.

A special part of the program was devoted to presentation of the service award pin to Earl Morgan for his outstanding work during the past year.

Another program offered a discussion on machine tools by M. K. Peck, assistant sales manager for Bullard Co., who showed a film, "Yankee Toolmaker."

-L. W. Montgomery



LEHIGH VALLEY—C. B. DeVlieg, president of DeVlieg Machine Co., Detroit, is being congratulated by Ralph Mueller, retiring chapter chairman, on his presentation of "New Arts in Jigless Precision Production Boring." Looking on is Vincent Scalese, newly elected chairman.—Chauncey R. Kay

# Leo P. Tarasov Heads Worcester Chapter

The new slate of officers who will direct activities of the Worcester chapter includes: Leo P. Tarasov, chairman; John C. Lalor, first vice-president; Cass Karpen, second vice chairman; Daniel W. Hoyt, secretary; Alvin S. Hamilton, treasurer; and J. Irving England, national delegate.

A recent meeting of the Worcester chapter was past chairmen's night. Honored guests included John Lindegren, Charles Monigle, Carroll L. Morse, E. Roland Ljundquist, John E. Rotchford, Albert T. Warman, Ralph E. Rawling, Ralph Baker, Carl D. Scholfield, and Adam T. Kosciusko, who all headed the chapter at one time or another.

Guest technical speaker was J. T. Duane, technical representative of Dow Corning Corp., who gave an illustrated talk on "Silicones for the Tool Engineer.

-Leon F. Miller

# New Officers Chosen By Fox River Valley

Fox River Valley chapter elected a new slate of officers at its meeting in St. Charles. Chairman for next year will be Robert Evans, assisted by Harold L. Smith, first vice chairman; Ralph Keck, second vice chairman; Ray Kastoll, treasurer; and Walt Phillips, secretary.

—H. L. Smith

# Microdrilling Discussed By John A. Cupler

At Pittsburgh chapter's February program, the technical program concerned the technique of microdrilling. John A. Cupler II, president of National Jet Co., Cumberland, Md., told how his company has developed equipment and drills capable of drilling 0.0001-inch diameter holes in stainless steel.

Honored at the meeting for his outstanding services rendered in organizing the first educational series on carbide tools, W. T. Mercier was awarded a pin for his work as chairman of the education committee.

At a previous session, the chapter heard a discussion on "Automation, Principles and Application." Speaker W. C. Allen, director of manufacturing equipment engineering, Westinghouse Electric Corp., pointed out the advantages and disadvantages in automating a production line.

-E. L. Caughey



TOLEDO—Winner of this year's scholarship is Arnold Field, left, junior mechanical engineering student at the University of Toledo. Presenting the award is Les Fox.

# Benton Harbor-St. Joseph Sees Carboloy Computer

Benton Harbor-St. Joseph members witnessed a demonstration of Carboloy's Machinability Computer at their March technical session. The presentation was made by E. J. Weller, manager of Carboloy Dept. of General Electric Co.

The previous month's program featured a talk on porcelain enamel by R. Stanley Sheldon, supervisor of ceramic research, Whirlpool-Seeger Corp. Also on hand was an exhibit of materials used in porcelain enamel.

O. W. Winter of Beardsley & Piper Div., Pettibone Milliken Corp., spoke at a recent meeting.

-Orvis L. Johnson



PONTIAC—Several chapter members inspect examples of honing shown them by Charles Staples of Staples Engineering (holding sleeve). From left are: front row, Andrew Forster, Link Johnson, Mr. Staples and Irvin Richards. Rear row: Charles Bay, Charles King and H. James Elliot. Mr. Staples, a charter member of Pontiac chapter, presented an up-to-the-minute display of honing materials and gave an informative talk on the manufacture and use of honing equipment. A movie on grinding wheels was shown by Link Johnson of Norton Abrasive Co.

# Lansing's Glen Crippen Elected Chapter Chairman

Heading the list of officers elected at Lansing chapter's Feb. 13 meeting is Glen Crippen, chairman. Other newly elected chapter officers are: Lyman Mack, first vice chairman; John Golata, second vice chairman; Peyton Beam, secretary; Arthur Reiser, treasurer; William Janetzke, national delegate; and R. Geitzel, alternate.

"What Is Automation," a technical address delivered by Charles F. Hautau, chief engineer at Hautau Engineering Co., was also given for the more than 100 members and guests.

Three films were shown to the Lansing chapter recently by R. H. Krepps, sales manager, Denison Engineering Co. Material offered information on the multipress and how to use it; index to profits; and blanking and forming on hydraulics.

-R. J. Krumrie

# Observe Automation in Ball-Bearing Manufacture

Some 250 Hartford chapter members and guests toured New Departure's Meriden plant and saw advanced automation in action in the manufacture of ball bearings.

After dinner a panel of New Departure men was the focal point of a discussion of the operations observed during the tour. Chairman and moderator was H. T. Burgess, plant manager.

Another tour was of the screw machine department of Underwood Corp. —Paul Pick

# Pennsylvania Chapter Elects Slate of Officers

Officers for 1956-57 were elected by members of the Northwestern Pennsylvania chapter at the Feb. 2 meeting. Administrative duties will be taken oven by John R. McClure, chairman; F. H. Grimone, first vice chairman; Don Wilson, second vice chairman; Ted Smeal, secretary; Clarence Arnold, treasurer; and Kenneth Stoll, national delegate.

Technical speaker for the evening was J. J. Wilson, sales engineer for Dow Corning Corp., who presented a talk and film on silicones. The meeting was held in the Knotty Pine Room.

-F. H. Grimone

# L. E. Dickerhoof to be Canton Chapter Chairman

Canton chapter's 1956-57 chairman will be L. E. Dickerhoof, with J. L. Nickas as first vice chairman; J. J. Babbo, second vice chairman; R. J. Killian, secretary; C. H. Roudebush, treasurer; J. R. Huet, delegate; and J. C. Richey, alternate.

The speaker of the evening, A. A. O'Sickey, sales engineer with Standard Tool Co., discussed the design and application of high-speed rotary cutting tools.

"What the Boss Wants" was the subject of a talk by Arthur C. Horrocks, public relations counsel of Goodyear Tire & Rubber Co.

-Clifford C. Smith, Jr.

# Tracer Control Talk At Merrimack Valley

A program on "Tracer Control in Action" was held by Merrimack Valley chapter at its Feb. 2 meeting at Greenridge Restaurant, Nashua.

The speaker was A. D. Gunderson, assistant chief engineer of George Gorton Machine Co. Also present was Richard D. Norby of Russell, Holbrook and Henderson, Inc., sales representatives for Gorton.

Rotary head milling was the topic of the chapter's meeting at the Andover Country Club, with William Huseby, sales manager of Kearney & Trecker, as speaker. He was accompanied by Hal Francke, advertising manager of Kearney & Trecker, and Fred Kunz, sales representative of Stedfast & Roulston, Inc.

—Arthur E. Clement



GRANITE STATE—Newly elected officers of the Granite State chapter are, from left: Robert Ellison, secretary; Frederick Wakefield, second vice chairman; Gino F. Magnani, chairman; Richard Downing, treasurer; Jakob Mutzbauer, retiring chairman.

# coming ASTE meetings

## National

Semiannual Meeting—of the National ASTE Board of Directors, Oct. 25-26, The Greenbriar, White Sulphur Springs, W. Va.

### Conference

Pennsylvania State University
—June 10-15, University Park, Pa.
"Short Course on Automation."

# Chapter

Boston—May 10, 6:30 p.m., New England Mutual Hall. Visit to Avery & Saul plant, Cambridge. "Quality Weldments" will be the technical subject.

CALUMET AREA—May 14, 7:30 p.m., Cape Cod Inn. "Role of High-Speed and Super High-Speed Steels in Modern Cutting Tools" by E. March, chief metallurgist of Crucible Steel Co.

COLUMBUS—May 9. Plant forum, Buckeye Stamping Co.

DAYTON—May 14. Anniversary meeting; coffee talk—"Adventure"; film by Jim Monesmith.

DETROIT—Senior section, May 10, 6:30 p.m., Auditorium of Engineering Society, technical meeting. Carbide section, May 10, 8 p.m., Junior Room, Engineering Society of Detroit, panel symposium. Education section, May 17, plant tour.

FAIRFIELD COUNTY—May 9, Stamford. Connecticut Tool Engineers' Day.

FORT WAYNE—May 9, 6:45 p.m., Huntington, Ind. Tour of Majestic Furnace Co.

Greater New York—May 7, 12 noon, Hotel New Yorker. Tool Engineers' Day. Tours to eight plants—choice of one. Technical sessions at 5:30 p.m., followed by banquet. Members and friends of neighboring chapters are invited.

Hamilton District—May 11. "Economics of Tool Design" by Harry Conn, Scully-Jones & Co.

HENDRICK HUDSON—May 16, 6:30 p.m., Circle Inn, Latham, N. Y. "Hydroform Process for Deep Drawn Shapes and Hydrospinning" by George Beatty, sales manager of Process Mach. Div. of Cincinnati Milling Machine Co. Indianapolis—May 3, 8 p.m., Antlers Hotel. Fathers and sons night. Representative of Firestone Tire & Rubber Co. will show film of 1955 Indianapolis 500-mile race; explain how knowledge gained about tires at the race has helped produce better tires for all uses.

Lehigh Valley—May 18, 8 p.m., Hotel Traylor, Allentown, Pa. Joint meeting with Allentown-Bethlehem chapter of ASQC. "Dimensional Quality Control" by Clifford Kennedy of Federal Products Corp.

LIMA—May 11, Clemans Bldg. Annual dance to raise money for chapter's annual scholarship.

LITTLE RHODY—May 3, 6:30 p.m., Johnson's Hummocks. Open meeting.

LITTLE ROCK—May 10, 7:30 p.m. "Principles and Techniques in Precision Measurements" by John A. Harrington, chief engineer of The DoAll Co.

ASTE 25th Annual Meeting will be held March 25 through 27, 1957, at Houston, Texas.

LONG BEACH—May 2, 7:30 p.m., The Petroleum Club. Panel discussion of "Optical Applications in the Fabrication and Inspection of Production Tooling."

Long Island—May 14, 8:30 p.m., Garden City Hotel. "Industrial Optical Tooling" by John H. C. Steele, research and development engineer, American Bosch Arma Corp.

LOUIS JOLIET—May 15. "Metallurgy and Its Application in Tool Design" by E. A. March, chief metallurgist, Crucible Steel Co. of America.

Monadnock—May 17. Plant tour of Kingsbury Machine Tool Co. Joint meeting with Twin States chapter.

Monmouth—May 15, 8 p.m., Red Bank Junior High School. "Plastics in Tooling and Tooling in Plastics" by Jack Horton of Fairchild Guided Missile Div.

NORTHERN MASSACHUSETTS—May 15, 7 p.m., Gardner. "Designing Jigs for Multiple Spindle Drilling" by Frank Zagar, Zagar Tool Co. Northern New Jersey—May 8. "Gears and Gear Shavings" by representative of National Broach Co.

PIEDMONT—May 5, Woman's Club, Thomasville. Annual dance.

PITTSBURGH-May 3. Plant tour.

SAGINAW VALLEY—May 17. Speaker will be T. R. Timm, master mechanic of Buick Motor Div. Tour of newly processed Buick Axle plant.

San Fernando Valley—May 2, Hody's Restaurant, North Hollywood. "Modern Carbide Turning for Small and Large Lots" by L. Romek, sales engineer, Monarch Machine Tool Co.

Santa Clara Valley—May 15, Old Plantation Inn, Los Altos, Calif. Stanley Brandenburg, Monarch Machine Tool Co., will speak.

Southeastern Massachusetts—May 15, Gaudette's Pavilion, New Bedford. "Design and Manufacture of Better and Cheaper Mousetraps" by Harry I. Dixon, president of Metallurgical Products Co.

Toledo—May 9, 7 p.m., Maumee River Yacht Club. "Tooling for Automation" by Harry Conn, Scully-Jones & Co.

TWIN STATES—May 17, Keene, N. H. Plant visitation of Kingsbury Machine Tool Corp. Joint meeting with Monadnock chapter.

# Mid-Hudson Group Hears Plastic Tooling Talk

Speaker at Mid-Hudson chapter's February 14 meeting at the Mirabel was George Rice, sales manager of Renite Plastics, Inc. His topic was "Plastic Tooling."

A film on "The Story of Fishing in New York" was shown. —Davis Gale



NEW ORLEANS—Leading chapter activities for the coming year will be, from left: Joe Natel, secretary; William Muller, first vice chairman; William Fricke, chairman; and John Blake, second vice chairman. Not pictured is Joe Emonds, treasurer.—Joseph Natel

# Tri-Cities Chapter Headed by R. M. Knabe

Ninety-eight were on hand for the Feb. 8 election night when members of the Tri-Cities chapter chose Rayburn M. Knabe to lead the group for the 1956-57 term. Also elected were: Don J. McKeon, first vice chairman; Albert Vande Walle, second vice chairman; James B. Rosborough, secretary; and Bob Larson, treasurer.

Program speaker was Frank H. Mertz of Greenfield Tap and Die Corp., who presented "Facts about Taps and Tapping."

On Jan. 9 members gathered at the Rock Island Arsenal Cafeteria to hear J. H. Mansfield, chief engineer with Greenlee Bros. and Co. discuss the subject "Transfer Machines and Automation."

—Don Shewry

# President Osborn Guest at Louisville

Harry B. Osborn, Jr., national ASTE president for 1955-56 and technical director of Tocco Division of The Ohio Crankshaft Co., was special guest and technical speaker at Louisville chapter's executives' night. Held in the Rathskeller of the Seelbach Hotel, the meeting was sponsored by the chapter's past chairmen.

Dr. Osborn, introduced by National Vice President Howard M. McMillen, spoke on the subject, "What's New in Industry?"

A highlight of the meeting was the presentation of the third annual \$100 scholarship award to George R. Hutchins, a senior at the University of Louisville.

—Sam T. Gleaves

# Discussion Use of Resins In Tooling with Plastics

More than 100 members of Houston chapter, meeting at the Ben Milam Hotel, heard a talk on the basic methods of preparation and basic applications of casting resins in the field of tooling with plastics. Speaker of the evening was E. Leslie Hall, sales manager of Chemical Development Corp.

Charles R. Heimlich, field engineer with Cincinnati Milling and Grinding Machine Co., discussed "The Hydrospin Process" at a recent meeting. He showed slides of the various forms of metal shaping by hydrospinning.

Public Relations Chairman August F. Huge, Jr., and his committee were honored for their work in producing the new issue of the chapter's Supplier's Guide and Roster. —George Bo-Linn



NORTHERN NEW JERSEY—Elected to head the Northern New Jersey chapter for the coming year are: seated, W. K. Perry, chairman; and J. Fleming, first vice chairman. Standing are: H. W. Ryno, delegate; A. S. Hylicke, treasurer; C. Slonkosky, second vice chairman; and A. J. Wotowicz, secretary. Another feature of this Feb. 14 meeting was the presentation of a color film on investment casting by William O. Sweeny, vice president of Arwood Precision Casting Co. More than 90 attended the meeting.—Sherwin W. Haas, Jr.

# Correction

The News Department regrets that the biographical sketch of James K. Carroll, published on page 142 of the

March issue, contained an error.
The sketch incorrectly stated that he was no longer with Brust Tool Manufacturing Co.
Mr. Carroll is still associated with the company in the



capacity of executive vice president. As stated in the sketch, Mr. Carroll is also executive vice president of Electrosize.

# H. N. Leymaster Will Head Nebraska Chapter

Chairman and national delegate of Nebraska chapter for the coming year will be Homer N. Leymaster, elected at the February 16 meeting. Also elected were Elmer V. Larsen, first vice chairman; Herbert K. Bro, second vice chairman; James C. Mercer, secretary; George S. Graves, treasurer; and Forrest W. Conover, delegate and director.

"Capital Investment" was discussed by Melvin Verson, executive assistant of Verson Allsteel Press Co.

About 70 members toured the American Meter Co. plant in Nebraska City recently.

—Dean W. Roper

# Officers Elected at New Haven Meeting

A new slate of officers was chosen by New Haven chapter February 9, with Stanley S. Porritt named chairman. Others elected are George G. Griffiths, first vice chairman; Russell C. Applegate, second vice chairman; Chester J. Rybacki, secretary; and James T. Kalleher, treasurer.

The chairman's pin for outstanding contributions to the Society during 1955 was presented to Jim Kalleher. "Quality Control" was the subject of a humorous talk by William L. Dowling, quality control manager of Greist Co.

L. D. Richardson of Eutectic Welding Alloys Corp. spoke on "Repair-Maintenance on Tools and Dies through Welding" at a technical session.

-Silas W. Becroft

# New Officers Elected at Battle Creek

Lionel Anderson was elected chairman of Battle Creek chapter at its Feb. 13 meeting. Mike Padgett was named first vice chairman; Orville Lusk, second vice chairman; Jack Gray, secretary; and Charles Larsen, treasurer.

C. H. Caldwell, district manager for General Electric Co., spoke on "This Is Automation."

-Arthur F. Damon

# BURGMASTER AUTOMATIC HYDRAULIC TURRET DRILLS

with Power Indexing produce a "higher level of quality" at Rendix Aviation Corp., Bendix Products Div., South Bend

They have this to say at Bendix, South Bend where 20 Burgmaster 6 spindle 2BH turret drills are effectively performing numerous secondary operations on aircraft parts -

"The work performed on the Burgmaster 2BH Models was previously run on 6 spindle hand-fed upright drill presses. The benefits derived over the old method of machining are:

- 1 With the drill fixture clamped in alignment under the spindle, a higher level of quality can be maintained and repair work has dropped to a minimum.
- 2 Operator performs work with less fatigue.
- 3 The uniform hydraulic feed enables us to produce better finishes and size.'

Machine tool users everywhere are experi-encing these and additional benefits such as: simplified fixturing, extreme versatility-jobs formerly done on turret lathes, chuckers, hand screw machines can be done with ease on the Burgmaster; low initial cost, low maintenance, little floor space required. They are finding that here, in one highly versatile machine, drilling, reaming, counterboring, countersinking, spotfacing, tapping, O.D. threading and many other operations can be accomplished with more accuracy-with one operator.

Automatic hydraulic Burgmasters (6 and 8 spindle models) feature skip indexing, automatic cycling and infinitely variable preselective feeds. All models (including the 6 spindle manuals) provide power





# DEVELOP FAST, SAFE MAGNETIC PARTICLE TEST

A less hazardous method of magnetic particle inspection using water as a solvent has been developed and is now being applied at the General Electric Co.'s jet engine plant near Cincinnati.

Several advantages are inherent in the new development. Primarily, it minimizes fire hazards. At the same time, it offers sensitivity in detecting defects equivalent to the conventional petroleum based method of magnetic particle inspection, while cost is reduced. The solvent used is not irritating to the human skin, providing both operator safety and additional savings from reduction in absenteeism.

Use of water in the method was made possible when a suitable wetting agent and rust inhibitor were found.

According to N. F. Frischhertz, manager of engineering for the company's Evendale operating department, every important alloy steel part in jet engines being manufactured at the GE plant are checked by the magnetic particle inspection method. This includes everything from compressor wheels to nuts and bolts. Indications are that the new technique will result in an estimated annual saving of about \$20,000 in the cost of solvents and pastes.

The method can be used with two different types of inspection: fluorescent suspendable method and the red visible paste method.

## PRECISION TIMING PERFECTED

### FOR RESISTANCE WELDING WORK

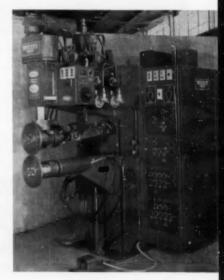
Resistance welding operations can be precisely repeated with a recently developed timer control used in a machine specially designed to accommodate it. The control, designed by Sciaky Bros., Inc., integrates the welding sequence cycle with cycles of a-c current. Timing of the welding sequence is initiated with the up-curve of the current cycle. Thus, in a typical sequence of welding events, such as "squeeze, weld, hold and off," the welding events would each take place for time periods accurate to a 60th second.

Heart of the new machine is the dekatron tube which serves to integrate pulsations and elements in the welding operation. It is a cold-cathode type gas tube having ten cathodes with two guide pins between each pair of cathodes. When power is applied to the tube, a negative voltage is applied to the cathode which is to be fired.

When the counting operation begins, pulses are fed to the guide pins and the glow is transferred from one cathode to the next until the preset count has been completed. From 1 to 10 steps or counts may be accommodated, and any operation which will furnish a pulse may be used to trigger the tube.

Operations involving more than 10 elements may be accomplished merely by adding a decade dekatron which permits the count to be increased to 100. Adding a third dekatron will increase the count to 1000. This is the maximum count of any of the functions on the new machine.

A rectifier used with the dekatron control provides great precision with a broad range of heat control. It has a peaking transformer firing system which prevents any unbalanced condition from



0

existing between successive impulses of alternate polarity. There can be no commutation fault. Rectifier ignitrons can be fired later in the cycle because of increased stability of the new circuit. Firing is from 45 to 135 deg after the beginning of the cycle.

The Sciaky control utilizes plug-in subassembly units, so that in a matter of minutes a defective unit can be easily replaced. Faulty components can be renaired at leisure.

Extra welder functions, to meet special application needs, are easily added because space is provided for additional plug-in subassemblies.

All welder functions are synchronous. All control dials for timing operations are calibrated in cycles, while control dials for interval functions are calibrated in secondary current impulses.

# UTILIZE FIBERGLASS FOR LIGHT, STRONG PARTS

Efforts to lighten the weight of hightemperature, jet aircraft ducting without lessening its strength have led engineers of Narmco Mfg. Co. to the use of reinforced fiberglass. The ducting, which ranges in diameter from 1 in. to more than 6 ft, is made of Conolon fiberglass laminates. According to the engineers, they have a strength-weight ratio higher than any other available material. Wall thickness of a single duct may range from 2 to more than 5 plies of reinforced fiberglass to accommodate varying degrees of stress concentration encountered in a complex system.

Resulting ducting is resistant to corrosion, heat and denting, and is unusu-



Scroll duct, fabricated of lightweight fiberglass laminates is readily fitted to the engine air induction assembly of Convair F-102 all-weather jet interceptor. Complexity of the system creates no unusual problem.

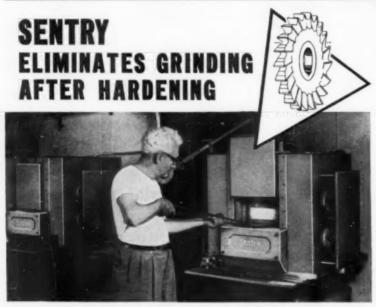
ally flexible. Expandable bellows sections also are easy to fabricate from the material.

Economical to produce, the ducts are laid up on inexpensive, expendable plaster molds. Each mold is cast from a master, assuring accuracy of interior dimensions.

# SPECIAL BORING MILL GIVES SPEED AND ECONOMY

Setup economy amounting to from 50 to 60 hours a month is gained with the new twin-column, floor type horizontal boring mill which utilizes permanently located fixtures at its 4 work stations. Another prime feature of the unit is the traveling spindle columns which enable the operator to take the machine spindle to the work rather than the work to the spindle.

Fixtures for each of the four different saddle type turret lathe beds being machined are permanently mounted on individual, floor level, cast-iron, stationary tables. Two 40-ft rails, at right angles to the tables, permit the twin columns to be moved individually according to need from one fixture to another. All motions are under pendant push-button control, with an operator regulating each of the machine's



A recent national survey of high speed steel tool manufacturers (making items similar to the milling cutter shown above) indicates that much time is wasted in grinding tools after hardening.

Many furnaces do not maintain adequate richness of atmosphere at high speed steel hardening temperatures. This necessitates subsequent grinding and finishing operations.

With Sentry furnace equipment employing the positive Sentry Diamond

Block atmosphere, tools may be soaked to assure maximum hardness characteristics and come from the high heat absolutely free from scale or decarburization. Sharp cutting edges are faithfully maintained and little or no finishing operations are required.

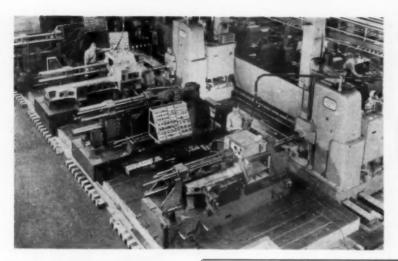
You too can save with Sentry quality controlled hardening on all grades of high speed and high carbon, high chrome steel. Consult Sentry for a demonstration on samples of your own tools.



Catalog R-47 Sentry ELECTRIC FURNACES

THE SENTRY CO. FOXBORO MASS.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-160



### PLATING PROCESS COMBINES HIGH QUALITY STANDARDS

Oualities of full brightness, high leveling and unusual speed are combined in a new high-speed bright nickel-plating process which just recently was released commercially.

Prime factors in the new technique. which is called Levelume, are recently developed addition agents. With them, it is possible to use an activated carbon pack in the filter for the plating solution, which continuously removes harmful organic contaminants. As a result, periodic batch purification is unnecessary.

Several other advantages are attributed to the process. It is characterized by good ductility and controlled stress in either the compressive or ten-

columns during simultaneous operation.

Floor level fixtures provide an operator safety factor; catwalks and guard rails are unnecessary.

Contributing to setup time savings are tool boards which are mounted on racks beside each fixture. Boards are sectioned off to represent individual bores in the headstock. Each section contains necessary rough and finish carbide boring bits to complete various diameters and faces which comprise one bore.

Including installation, which required an excavation 20 ft wide by 40 ft long and deeper than 6 ft in some places, cost of the machine was approximately two-thirds that of two conventional boring mills.

### FASTER BRAZING

Another new development has made possible faster brazing operations at reduced cost, minimizing the role of the operator. The development is a result of a new material produced by American Silver Co., either as a ferrous or nonferrous metal strip, clad with a predetermined thickness of silver brazing alloy on one or both sides.

This strip material is used either as a brazing shim where close control of flow of the brazing alloy is mandatory, or where the entire part is stamped and formed from the material so that the entire surface of one or both sides of the metal is completely covered with the silver brazing alloy. In this way, the brazing alloy is automatically preplaced so that blind joints and joints of large area can easily be accomplished.

Metals clad with the brazing material can be blanked from a stamped, rolled, bent or otherwise shaped as if the brazing alloy were not present.

# **PRECISION**

BORING . GRINDING . MILLING

An exhibit of the latest and finest in Spindle design and performance, to reduce your tolerances and production costs.

### EXHIBIT A

POPE SUPER-PRECISION, HEAVY DUTY BORING SPINDLES for boring holes round within millionths of an inch. Available in both belt driven and motorized units to meet a wide range of speeds and horsepower. Send us your specifications for quotations.



### EXHIBIT B

NDLES

POPE



ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES with double row cylindrical roller bearings and separate thrust bearings for no endwise movement of the shaft

EXHIBIT C

NEW POPE QUICK,

SELF-REMOVING

WHEEL HOLDER for surface grinders and too and cutter grinders — elimi

nates the necessity of a wheel

### POPE





# Milling,

DIRECT

EXHIBIT D



POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swivel-ing Heads for Angular Adjust-ment in A Vertical Plane

# EXHIBIT F

POPE HEAVY DUTY VEE BELT DRIVEN, PRECISION MILLING SPINDLES. nd Wheel Heads, 1/2 to 50 HF

# EXHIBIT G

POPE INTERNAL GRINDING SPINDLES for Bryant, Excelle, Heald and

### EXHIBIT



POPE SUPER-PRECISION HIGH FREQUENCY HEAVY DUTY GRINDING AND for speeds up to 100,000 RPM

MACHINERY CORPORATION 261 River Street Haverhill, Massachusetts

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

Builders of the Revolutionary New POPE Super-Precision Borin chine That Bores Holes Ro

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FOR RUGGED VERSATILITY AT A PRICE THAT'S RIGHT, GET

# STUB DRILLS

Fact is, drills just don't come any tougher than Ace Stub Drills. Their short, heavy duty flutes are precision ground into a solid, continuously hardened bar of top grade high speed steel. This special Aceoriginated process makes possible a finer finish, plus keener cutting lips and extra strength . . . results in less wear and breakage, longer drill life. As for versatility, Ace Stub Drills are designed for close-to-work screw machine operations and they're ideal, too, for portable drilling. They're stocked in over 130 standard sizes to meet your particular requirements, and they cost approximately 20% less than equivalent jobber length drills! Call your local Ace , Distributor the next time you need drills ... or send for complete information today!

ACE DRIL Adrian, Mi	L CORPORATION chigan
containing comp	ase send me your Cutalog No. 52-A lete Information on ACE "Ground-from- and hardened H.S.S. drill blanks.
COMPANY	
ADDRESS	
CITY	STATE



INDICATE A-5-162-1

sile side, resurring in deposits without crack, craze, lifting or brittleness. The technique appears effective within a current density range of from 20 to 150 asf. High leveling characteristics of the deposit fill in scratches to a degree which often eliminates need for polishing and buffing. Pieces can be double coated if higher corrosion protection with a given nickel thickness is desirable. Deposits have high surface activity and plated surfaces accept chromium or other deposits without additional treatment. Recessed areas of a part have uniform brightness without

The bath is stable in operation, is simply controlled, has high tolerance to impurities. Rough deposits are not encountered because of the agitated and continuously filtered bath. Plating temperatures range from 145 to 160 F. Ventilation is optional as there is no harmful or unpleasant odor released.

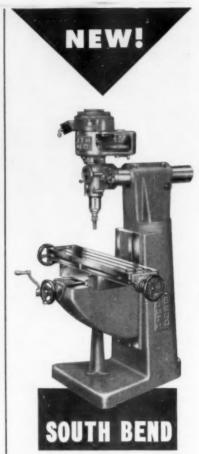
According to engineers of Hanson-Van Winkle-Munning Co., which developed the process, practically any existing nickel-plating process can be converted to the new method in a matter of a few days. No special auxiliary equipment need be installed, although the tanks must be cleaned and bleached. Most rubber-lined tanks previously used with bright nickel solution may be employed with the new process.

# INSPECT SURFACE FINISH AT PRODUCTION LINE

Considerable waste may be avoided in finishing operations by checking surface finish at the machine instead of deferring that step until a part reaches the inspection department. Earlier checking could possibly serve to provide two economies. The practice may eliminate rejection of parts because of a too coarse finish, a fault which could be easily corrected at the machine. Equally important from an economic standpoint, it may prevent excessive finishing beyond the point necessary for proper functioning of a specific piece.

Companies now using portable inspection equipment to check finish at the machine have found that this procedure makes it possible for the operator to set up his equipment for proper tooling, speeds and feeds to produce optimum results. Such use also permits frequent quality checks during a production run, and thus provides prompt warning if the finish fails to meet specifications.

In the illustration, the portable instrument used is the Surfindicator, made by Brush Electronics Co., a division of Clevite Corp. The unit weighs only 15 lbs so can be easily and quickly trans-



VERTICAL

### MILLING MACHINE

Exceptional versatility, accuracy and speed give this new milling machine the ability to keep machining costs low on a wide variety of work. Its simplicity of design provides ease of acessibility and set-up which simplify operation and job change-over. Ideal for toolroom, production and maintenance work. Write for complete information.

## SPECIFICATIONS:

Table travel—20", or 30" Spindle to table—20", Spindle to column—20", Ram travel—15", Speeds—8.

### SOUTH BEND LATHE

South Bend 22, Ind. es, Shaper, Milling Mach Drill Presses, Grinders



INDICATE A-5-162-2 The Tool Engineer



ported to any part of a plant. It measures surface roughness of metal, plastics, glass and vitreous ware, ceramics, paper and other materials. The dial is calibrated in terms of new ASA specifications, and the unit can be used on flat or curved surfaces, or to measure internal finish of bores.

# INSTALL GIANT VERTICAL HEAT TREAT UNIT

Parts 10 ft 8 in. long can be handled in the new vertical heat treating furnace installed at Pittsburgh Commercial Heat Treating Co. Furnace chamber is 45 in. in diameter and maximum temperature 1850 F. An adjacent tempering furnace has the same dimensions.

The design, by company vice president Elmer Cox, combines a stationary furnace beneath which quench tanks (oil or water) are moved and into which heated parts are lowered. To load the furnace, parts are placed on a movable car and pulled upwards in the retort.



NOW ...

# AVAILABLE FROM STOCK AWAILABLE FROM STOCK

WITH
STANDARD
HAND TAP
SHANKS!

Here's the answer to the problems presented by conventional pipe taps! Exclusive Jarvis Pipe Taps with standard hand tap shanks easily fit any tapping machine or device—with never a chucking bottleneck. This addition to the dependable Jarvis line of standard taps affords new tapping versatility and precision.



Send Today for Catalog!

Here's the big advantage of Jarvis taps with Standard Hand Tap Shanks—

	1/4"—18 N P T Standard Pipe Tep	1/4"—18 N P T New Jarvis Pipe Top
Shank dia.	.5625	.480
Square size	.421	.360
Overall lgth.	21/16"	31/16"

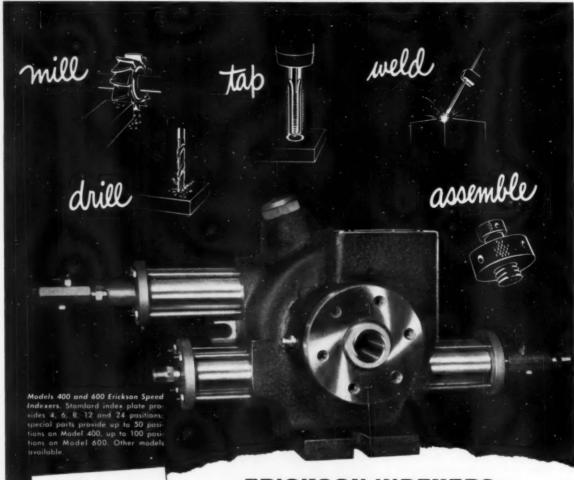
Three other sizes are stocked—½", ¾", ½"—and all save man-hours, production dollars.

A Jarvis representative is as near as your phone



Complete manual with tap data and tips for better tapping is yours for

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-163



Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth



# **ERICKSON INDEXERS-**

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down expensively without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure positive positioning and angular accuracy within 2 minutes of a degree. (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . accuracy to reduce rejects . . . long life to cut maintenance and capital investment – all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.

Write for Erickson Catalog K today! You'll find many interesting applications for all Erickson holding tools. Take advantage of our free engineering service.

An Erickson field engineer will gladly work with you for production economy.

# ERICKSON TOOL COMPANY

2303-5 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS . FLOATING HOLDERS . TAP CHUCKS . TAP HOLDERS . AIR-OPERATED CHUCKS

EXPANDING MANDRELS . SPECIAL HOLDING FIXTURES



# Flywheel Balancer

An automatic machine designed to balance flywheels in an automobile engine plant at the rate of 125 pieces per hour offers broad application possibilities to other fields. Ipstalled in a conveyor system, it performs the complete balance cycle of location, measurement and correction without an operator. Balancing and correction is achieved simultaneously in a conveyor.

Fundamental design of the machine suggests its use in correction areas where removal of material for balance may be limited to certain locations. Economies of automation can be effected on most high-production applications.

Micro-Poise Engineering and Sales Co., 14851 Grand River Ave., Detroit 27, Mich. T-5-1651



# Lubricant

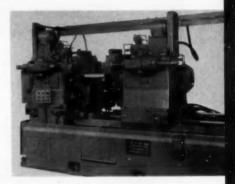
All-purpose Primaleen lubricant offers unusual tenacity and ability to fill pores of surfaces, thus reducing friction at high pressures, high sliding velocities and close clearances. Possessing thixotropic characteristics, the new substance will not drip even when afire. It resists water, chemical vapors and temperature changes, and protects against rust resulting from use of soluble oils. At -30 F, there is no flaking or crystallization. It has a 355 F open-cup flash point.

Protecto-Lube Co., 2832 E. Grand Blvd., Detroit 11, Mich. T-5-1652

# Milling-Centering Unit

This universal, production type automatic milling and centering machine is quickly set up for lengths to 48 in. and drills to a depth of 4 in. Two triangular fixtures with six trunnion vises index 120 deg between three stations, including load-unload, mill and center drill. These three operations are simultaneous.

Automatic indexing is by hydraulic power. Parts are manually loaded into the work-carrying fixture at the front of the machine, are progressively indexed to the milling and drilling stations, and back to the front of the machine for unloading. As an added accessory, automatic loading and unloading can be incorporated in order



to fully mechanize the milling and centering operations.

Work-carrying vises and the housing supporting the machining units on the right-hand side are adjustable for lengths to the full machine capacity. Manual clamps secure the housing to the ways to insure rigidity.

Milling heads are of single-speed type, and are adaptable for carbide tooling. Speed changes are available with change gears. The quill type spindle has a 2-in. manual adjustment by graduated dial with a positive manual lock. Feed rate of heads is infinitely variable. Single-speed quill feed drilling heads also have infinitely variable feed rates. Spindles are direct driven by timing cog belts, but speed changes can be made by belt and pulley change.

The Motch & Merryweather Machinery Co., Machinery Mfg, Div., 888 E. 70th St., Cleveland 3, Ohio, T-5-1653

# Automatic Metal Marker

High-speed production marking equipment, featuring a standard Series 20 dial type marking machine, is equipped with vibratory parts feeder for production marking at speeds up to 7500 pieces per hour.

The basic machine utilizes the rollmarking method for applying a permanent sunk impression into the OD of small round or conical workpieces by rotating the workpiece between a revolving backup roll or pressure dial and a concave marking die or type



the MASERATI HORIZONTAL & VERTICAL NG MAC POWER MASERATI RECISION ECONOMY Manufactured by highly skilled specialists · Power rapid traverses in all directions Wide range of speeds and feeds **Dual** automatic selection of speeds and feeds · Dual controls for all power feeds and rapid traverses . Dual controls for clutch and brake COMPLETE INFORMATION AVAILABLE Write for Detailed Specifications Today esigned, built, tested, PORATION OF WESTBURY, NEW YORK

setup. Depth of mark is controlled with uniformity from piece to piece, regardless of slight variation in diameter.

A continuously rotating carrier dial and pressure dial are mounted on a heavy-duty spindle driven by a 1/3 or 1/2-hp motor. Infinitely variable speed adjustment is available to suit production requirements or to match an operator's ability to manually load. Model 435 (illustrated) was designed for feeding loaded fuse parts which, because of weight and high-production quantities required, necessitated the use of a 30-in. diameter bowl and a dual track running to the marking machine. Group I, Class D, explosionproof controls and wiring are used throughout the installation.

Noble & Westbrook Mfg. Co., East Hartford, Conn. T-5-1661

# Wrench Attachment

A right-angle attachment, No. 568, fits any  $\frac{1}{2}$  in square air or electric-driven impact wrench.

Featuring a 29/32 in. spindle, offset front, right and left to permit operators to move in close on tightly confined



work, the compact unit is less than 6 in. long and has a head height of only 2% in. It weighs 2½ lb.

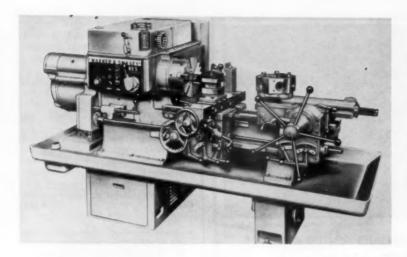
Spindles are built of tool steel and all gears of alloy steel. Oil-sealed antifriction bearings give maximum power delivery.

Thor Power Tool Co., Aurora, Ill. T-5-1662

# **Universal Turret Lathes**

Simplified operating controls and faster speed changing through the use of an all-hydraulic headstock are among design features of the Nos. 4 and 5 (illustrated) universal ram type turret lathes.

Engineered for specific work sizes, the new units provide balanced power and maneuverability. Both machines



# Safety Controller

An automatic safety controller provides warning and prevents damage from abnormal load conditions of any kind on electrically driven conveyor systems.

The electromechanical device, called the Tipp-Tronic, affords protection for conveyor overload without mechanical devices. In addition to conveyor protection, the unit also provides electric motor protection.

A self-contained package that combines all the features of fuses, circuit breakers, ammeters and tong testers, the unit instantly and automatically shuts off the conveyor system at any predetermined load setting. Highly sensitive and accurate, it measures and acts

are fully adaptable to existing tooling and, in addition, can be used with the latest special turret lathe attachments.

Operator's controls are zoned, with one lever at the headstock actuating all speed changes; another lever providing "forward," "reverse," "brake," or free-spindle operation. A headstock mounted direct-reading speed preselector, calibrated in rpm, surface speed and work diameter, makes possible rapid selection of proper spindle speed.

Constant-mesh helical gearing and direct-acting hydraulic clutches in the headstock preclude gear shifting. Instantaneous spindle speed changes are made by moving the machine's single speed-control lever. Hydraulic clutches used require no wear adjustment, and their smooth, shockless operation insures good headstock performance.

Cross slide unit is strong and functionally designed to assure fast, efficient metal removal without excessive weight. It also is easily maneuverable. The carriage is gibbed to the front bedway, anchored on the rear way and supported by still a third way at the base of the bed, giving maximum strength, rigidity and accuracy.

Six reversible power feeds; both cross and longitudinal, are provided with automatic feed trips in the compact feed apron. Twelve spindle speeds with a 2-speed motor, in a 62.2 to 1 overall range, are standard on both the Nos. 4 and 5 universals. Speeds on the No. 4 are 30-1866 rpm with a 15/7½-hp drive motor, while the No. 5 provides 25-1556 rpm with a 20/10-hp drive motor.

The No. 4 swings  $18\frac{1}{8}$  in. over the bed and  $9\frac{1}{2}$  in. over the cross slide. The larger No. 5 machine swings 20 in. over the bed with  $10\frac{1}{4}$  in. over the cross slide.

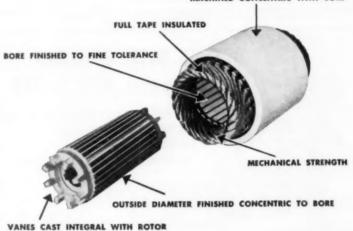
The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. T-5-1671

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Attach this ad to your letterhead for free demonstration or literature!



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**ONE** Drill Grinder

Sharpens ALL Drills



• 1/8" to 21/2" Diameter

• 2-3-4 Flutes

Without Chucks or Collets

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(11" swing-14" between centers) At LESS Cost

Sterling Model "RK-2" provides more capacity at half the cost of a Universal Grinder, Write for details.

McDONOUGH MFG. CO.

1517 GALLOWAY . EAU CLAIRE, WISCONSIN

upon variations from normal load over a wide range. It may also be set up to give warning or alarm of impending trouble before the shutoff stage is reached.

On multi-motor-driven conveyor applications, one Tipp-Tronic may be used as a control on the total current of all the motors, or one unit may be used with each motor.

The Tipp-Tronic is not affected by line voltage variations. On most conveyor applications, the unit is reset manually after it has given an alarm and shut off the system.

Tipp Manufacturing Co., Tipp City, T-5-1681

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OF TODAY INFORMATION

# Part Numbering Units

A line of Unimark part numbering units have individual interchangeable numbers. They are designed to emboss part numbers and letters at the same time hole-punching and notching operations are performed on the workpiece. No alignment is required as the holder maintains accurate alignment on all operating parts.

Punches of these new tools can be adjusted to conform with shut heights of Unipunch hole-punching and notch-



ing units, and depth of penetration can be adjusted. With the easily and quickly removable block in front of the holder, the numbers and letters may be changed without removing the entire unit from the setup or disturbing other units in the setup.

Unimark units are available with 83% in. shut height with  $3\frac{1}{2}$  in. die height and 51/2 in. shut height with 21%2 in. die height.

Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y. T-5-1682

# Hand Pump Pressure Oiling System

Lub-O-Jet is a centrally located, easily accessible, positive, self-contained oiling system that delivers oil, under pressure, to various points of all types of equipment. It is particularly suitable for difficult-to-reach locations. A pressure pump is built into the 4-oz shatter-proof reservoir, and a 6-outlet dis-



tributor is connected to the reservoir assembly. Oil supply is always visible.

Plastic, transparent and flexible, tubing of \( \frac{1}{8} \)-in. OD is attached to the distributor outlets and runs to the bearing points which can be as much as 100 feet away, in any direction. A small amount of oil is fed to all bearings simultaneously each time the pump is stroked. All feed tubes remain filled, ready for the next cycle. Production need not be stopped for periodical hand oiling.

Trico Fuse Mfg. Co., 2948 N. 5th St., Dept. TT, Milwaukee 12, Wis. T-5-1691

# Control for Drilling

A new electronic control system for drilling machines enables an operator to "dial" the X and Y coordinates of a desired hole location. Any drilling operation may be accomplished merely by pressing a button. There is no need for manual laying-out, checking, centerpunching or hand drilling. The control-equipped machine is especially suited to operations for which autematic numerical control is not economical.

The traveling drill head and movable table can each move 4 ft perpendicular to the other to permit positioning of the cutting tool anywhere over a 4 x 4 ft workpiece. Step methods permit handling of larger sheets.

A multiple-spindle attachment to the drill head allows simultaneous drilling of up to 5 holes of varying dimension, with an accuracy of 0.005 in. A variable-speed motor provides proper spindle speeds for drills as small as ½2 in., while belt reduction permits sawing or fly-cutting of holes up to 6 in.

Various controls provide for jogging all machine motions, changing spindle speed, sequencing drilling operations, and permitting choice of constant-feed or constant-thrust drilling. Reset controls are also provided to return the head and workpiece to a convenient location following single operations.

Minneapolis-Honeywell Regulator Co., 2747 4th Ave., S., Minneapolis 8, Minn. T-5-1692

# Thread Rolling Machine

A new type circular roll threading machine for high-production thread rolling of studs and machine screws has no cams, slides, hydraulic systems, fixed work rests or reciprocating motions. Equipped with hopper feed, it will produce up to 5200 parts per hour, ranging in thread size from ½ to ¾-in. OD by 2 in. long.

Rolling is performed by two interchangeable and reversible precision ground rolls rotating at different speeds.

Parts are fed tangentially between the rolls by revolving work feeder ring, falling free after rolling down a chute



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thousandths...production in the millions...
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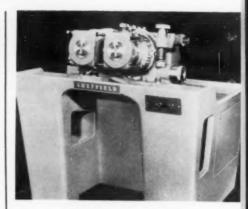
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to a container. The feeder ring can be magazine loaded, manually or automatically. Different roll speeds and timing of the feeder ring assures equalized roll wear.

Timing of the rolls is infinitely adjustable.

Rolls are available for any type thread form within these size ranges: 0 to ¼-in OD x 2 in. long; ¾6 to ¾6-in. OD x 1½ in. long, and ½ to ¾6-in. OD x 1¼ in. long.

The Sheffield Corp., Dayton 1, Ohio.

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# **Probe Type Pyrometer**

All types of noncorrosive metallic and nonmetallic liquids, as well as atmospheres of furnaces, kilns, ovens and other high heat containers, may be checked with this hand-held probe pyrometer.

Although light and easily portable, it can be used in heavy service because



of its strong construction. It is finely balanced for constant hand use. Chrome finish throughout provides an external reflective surface that prevents absorption of heat which would normally change the cold junction temperature. A calibrating thermometer is built into the unit and is positioned at the cold junction to provide a more accurate means of calibration for the cold junction. The thermocouples are refractory

bead insulated of the closed end type.

The probe is 19 in. in length and comes in two types: chromelalumel couple which measures to 2300 F, and the iron constantan couple which measures to 1600 F. The thermocouples may be easily replaced. The D'Arsonval Meter movement has 2 4/6-in. length of scale and an easy adjustment screw for cold junction temperature.

The Pacific Transducer Corp., 11836 W. Pico Blvd., Los Angeles 64, Calif.

T-5-1711

slider, calibration adjuster, adjustable limit pointers, and reference thickness standards.

A "go not-go" feature built into the gage helps maintain quality control on surface coating thicknesses. After the instrument is calibrated and adjusted for the specific range limits, the user need only note if the null pointer stays between red upper and lower limit pointers. When using the "go not-go" feature, the gage is calibrated for the nominal value of the thickness to be



# Screw Machine Drill

A series of low-cost high-speed, straight shank, short length drills are specifically designed for use in screw machine drilling operations.

Engineered with correctly proportioned web thickness, flute contour and



spiral, the drills provide ease of penetration, efficient chip removal and long life between resharpenings. The screw machine drills are available in fractional, wire gage and letter sizes in both right and left-hand styles.

Whitman & Barnes, 40609 Plymouth Rd., Plymouth, Mich. T-5-1710

# Thickness Gage

A hand-held permanent magnet thickness gage operates without power. It is designed for quick, accurate non-destructive measurement of the thickness of nonmagnetic materials bonded to smooth iron or steel. It also will measure the thickness of nonmagnetic materials which can be placed over a magnetic reference plate. Typical materials which can be measured are paint coating, platings, enamels and sheet materials such as plastics, paper and mica. It is equally useful on conducting and nonconducting coatings.

The small, portable gage consists of a double range scale (high scale from 0.001 to 0.060 in. and low scale from 0.000 to 0.007 in.), range changing





# Now! Closer gage block tolerances give you up to 75% longer wear life at no increase in price!

Ellstrom Standards are now produced and unconditionally guaranteed to specified millionths well within the following improved gage block tolerances:

"W" Working Accuracy Blocks: +.000008", -.000002" per inch of length, with flat-ness and parallelism held within .000006".

"I" Inspection Accuracy Blocks: +.000004". -.000002" per inch of length, with flatness and parallelism held within .000004",

In addition to providing finer accuracy at no increase in price, these Ellstrom Standards also give you up to 75% longer wear life. For, by reducing the allowable "minus" deviation, you get an additional guaranteed wear allowance of from 2 to 6 millionths of an inch, as compared to common industry standards, before the blocks need be considered worn undersize.

Ellstrom Standards are furnished in 28 basic sets of from 8 to 92 blocks in both rectangular and square styles. Individual blocks are also available in sizes ranging from .010" to and including 20.000 meet your particular needs. Send for complete specifications and prices today!

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"I" Accuracy: \$152.75

measured.

The PM thickness gage is accurate to +5 to +10 percent within 50 percent of the calibration point and is capable of taking readings in any position.

Four thickness standards are furnished with the gage, and 10 extra standards are available, ranging from 0.0005 to 0.060 in.

General Electric Co., Instrument Dept., Lynn, Mass. T-5-1721

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Carbide Tool Grinder

A new offhand single-point carbide tool grinder, designated Poweramic, produces microfinishes on all standard and special single-point tools, vet requires no lateral tool movement ordinarily performed by the operator. There is virtually no operator fatigue, and only a slight pressure on the worktable is needed to feed the tool into the grinding wheel.

Among the grinder's feature are the TruArc oscillation of the grinding



wheel and free-wheeling counterbalanced worktable.

The motor-spindle-grinding wheel assembly is supported on pivots and the entire motor-spindle unit is oscillated mechanically by a motor-actuated crank mechanism at the rate of 150 strokes per minute. Oscillation of the motorized spindle and wheel unit across the carbide tip results in: multiple crosshatched honelike finishes, fast metal removal, long wheel life through distribution of wheel wear and less chance of wheel gouging.

True angular settings of the worktable, ranging from 7 deg above and 20 deg below horizontal, are obtained by a crank mechanism. Settings are registered on a large, visible protractor on the side of the machine base.

Coolant is supplied through a selfcontained pumping unit in the base of the machine.

Spindle motor is a 1-hp, reversible, 220-volt, 60-cycle unit giving a spindle speed of 3450 rpm. Gear motor for the crank mechanism is \(^3\)-hp, 220-volt, 60-cycle at 1130-rpm. A \(^3\)-ho-hp, 1750-rpm motor is used for the coolant pump.

Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich. T-5-1731

# **Filtration Unit**

This redesigned filtration unit, known as the Vac-40 Vacumatic filter, is completely automatic and self-cleaning. Designed for use where continuous and effective filtration of coolants is desired, it employs vacuum rather than gravity and is capable of delivering unusually high flow rates in sustained operation.

Using a specially fabricated paper as its filtration medium, the unit delivers dry sludge with no coolant carry-over. The paper filter medium is supported by an endless fabric belt, carried on a wire mesh belt. A large vacuum chamber is located directly beneath this belt, and the vacuum tends to hold the paper tight against supports.

Solid particles are deposited on the paper and, when caked so thick that suction can no longer be effected through the belt, the belt is automatically indexed forward. This provides a new filter area without shutdown of the unit for cleaning. Sludge and dirty paper are discharged into the unit's tote box.

There also is an automatic overflow. Should there be a temporary loss of vacuum or clogging of the unit, the pump delivers unfiltered coolant to the work.

Industrial Filtration Div., U. S. Hoffman Machinery Corp., 103 Fourth Ave., New York 3, N. Y. T-5-1732

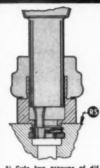
# Face Milling Machine

The Kling Mill-All beam and column mill is designed to do a wide variety of facing jobs with speed and economy. The unit also may be used for plate edging and can be adapted to mill aluminum and other nonferrous materials."

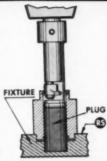
Metal removal rates of the machine are from 40 to 80 cu in. per minute (with cuts up to \$\frac{3}{4}\$ in. deep). Horizontal cutter travel ranges from 72 to 144 in., while vertical cutter travel ranges from 60 to 84 in., depending on the models.

The high cutting capacity is largely due to the specially designed indexable blade carbide face mills. The large,

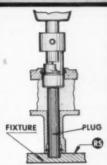
# Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!



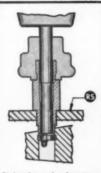
 A) Cuts two grooves of different depths and widths in one single operation from same reference surface.



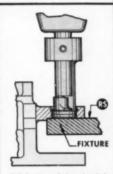
B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plus.



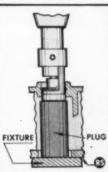
C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.



D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.



E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.



F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

Amazingly versatile! Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

Wide Cutting Rangel The Waldes Truarc Grooving Tool comes in 5 models...enabling you to cut accurate grooves in housings with diameters from 250 to 5.00 inches.

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1854, 82.55

PABRICATED MATERIALS AND PARTS by T. C. Duslond. A comparison of cost and design factors to help you select the right metal-forming methods for the greatest economy in manufacturing small industrial parts. Contains a valuable fold-out chart (over 2.% feet long) showing at a glance the cost, design and production comparisons between various manufacturing methods. This chart alone is worth many times the bonch's cost to production men. 1953, \$6.58

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PROTECTIVE COATINGS FOR METALS, Now 2nd Edition, by R. M. Burns and W. W. Bradley. Greatly enlarged and aimost entirely rewritten, this new edition of Burns' world-famous ACS Monograph contains the latest information on the composition, properties and performance of metallic and organic coatings. Over 640 pages of rabiable material concerned with the technology of corrosion control.

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heavy carbide blades may be indexed to 8 cutting positions before regrinding is required. The cutter spindle drive motor is 40 hp with 75-hp motor also available and the feed motor (horizontal or vertical) is 3 hp.

All machine operations are controlled from a simple, easily operated pushbutton control panel, mounted on the operator's platform. Both platform and panel travel horizontally with the machine.

Primary construction of machine is welded steel. Vertical feed screw is protected by telescoping tubular brass covers, and both the horizontal and vertical ways are nonmetallic. Telescoping steel covers are used to protect the horizontal ways. Motor is mounted on a slide which provides for 10 in. of in-and-out travel of the cutter.

Kling Bros. Engineering Works, 1320 N. Kostner Ave., Chicago 51, Ill.

T-5-1741

# **Digital Computer**

Alwac III-E, a low-cost medium-speed high-capacity electronic digital computer is designed for great flexibility including ease of programming. It will pick up two instructions simultaneously and has been improved to allow automatic modification of the address of the number to be operated on by an instruction.

Coders of Alwac III-E can repeat sequences on numbers stored in different parts of the memory without chang-



ing the form of the instructions. Only one program step is needed to set the special editing register which modifies the address, saving time formerly required to change instructions in a sequence before using them again. The same register acts as an automatic tally for repetitive sequences of operations in the computer.

By picking up two instructions simultaneously, the Alwac III-E permits the second instruction to be carried out as soon as the first is finished, without a second reference to the drum memory.

The unit operates with punched cards, magnetic tape and automatic typewriter.

Logistics Research, Inc., Redondo Beach, Calif. T-5-1742



# TOUGH LITTLE DRILLS THAT PACK A BIG WALLOP ON AUTOMOBILE ASSEMBLY LINES

New York's body drills are specially designed for accelerated assembly lines. You'll find them in the country's largest auto plants because they bite fast, make clean quick holes and are extra tough for long and continuous service.

These heavy duty drills feature extra sturdy shanks, short flutes — with or without radial relief — and split points that help minimize operator fatigue. Then there's New York's special nitriding and homo-treating to add to their toughness. As with our standard drills, New York's body drills give you a saving of 20%

All New York drills are made to last longer and give greater production. Holes are perfectly round, exactly on size without burrs, and you get more holes per drill. Perfect reasons for using New York drills on your assembly line — or wherever there's a difficult operation.

Write now for catalog, technical manual and net prices.



# NEW YORK TWIST DRILL COMPANY, INC.

EASTERN HEADQUARTERS: 278 Lafayette Street, New York 12, N. Y. MIDWESTERN HEADQUARTERS; 30-A North Clinton Street, Chicago 6, III.

INDICATE A-5-174-2

# Precision Checking Device

Angle of deviation from true horizontal or vertical can be quickly proved on most movable or mounted fixtures with this low-cost precision checking device. This instrument, called the



Magnatheck, assures fast, positive inspection in any position of angle plates, angle bars, dies and tools.

Because of its powerful permanent magnetic base, there is no necessity for clamping it in position.

Magna-Lock, Inc., 283 Maple St., Big Rapids, Mich. T-5-1751

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## **Automatic Travel Torch**

The new Model L-3 automatic travel torch makes gouges on all metals as smooth as those cut by machine operation. It is especially useful on applications requiring long gouges, cuts or bevels, and where there are no intricate configurations or complicated lines of travel. The tool is positively held and moved by a machine on a track. On



circumferential seams it is held in a fixture with the work rotated.

Speed of travel can be predetermined and set at a constant rate for maximum efficiency. The only variable left to the operator is feeding the electrode into the work, which is done by racking the cylindrical tube that holds the electrode, as the electrode is consumed. Depth of gouge also is controlled at this point of operation.

The Model L-3 Arcair torch is designed to take electrodes up to 3% in. in diameter, and a larger model, L-5, for electrodes up to 5% in., is also available.

Arcair Co., 419 S. Mt. Pleasant St., Lancaster, Ohio, and Bremerton, Wash. T-5-1752

# Hydraulic Slotter

This heavy-duty hydraulic slotter, built with 36 and 48-in. stroke lengths, is designed for accurate, rapid machining of all metals. Construction provides ample strength to utilize full power of the machine. All cross, longitudinal and rotary movements are controlled by the pendant.

Full hydraulic drive, having two speed ranges, has serve control to the pump so that cutting speed may be infinitely varied from zero to maximum in either range. Feeds are hydraulic and they also may be infinitely varied from zero to maximum.

Longitudinal, transverse and rotary movements are operated and selected

# Die Head HOLLOW MILLING



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# Look For These Important Features



### For All Hydraulic and Other Low Pressure Liquid Systems

In the selection of a filter to obtain maximum afficiency and quality, the most important point to consider is a specific type filter that will offer greatest ACTIVE filtering area with ample storage capacity for filtered out particles, rather than total filtering area alone. Over 650 Original Equipment Manufacturers install Marvel Synclinal Filters as Standard Equipment beturers install Marvel Synclinal Filters as Standard Equipment because they are designed to give this all-important balance for greatest efficiency in filtration of liquids in all hydraulle and other low pressure circulating systems. Flow of liquids is maintained at a constant, steady rate of speed produced by the pump which brings about the desired effect of a gentle, evenly distributed accumulation of filtered out particles against the entire filtering surface with less restriction of flow. Result—longer periods of productive operation at minimum maintenance down-time. If this important happers is locking due to efforts tonger periods or productive operation or minimum maintenance down-time. If this important bolonce is lacking due to efforts to cram too much filtering mesh for the sake of total rather than active area, filters soon become clogged causing pressure build-up, furbulent flow and in general decreases the efficiency of operating equipment. Depend on Marvel Synclinal Filters For All Your Fiftration Requirements.

### EASY MAINTENANCE

Both sump and line types may be easily disassembled, cleaned and reassembled by any workman, on the spot, in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections

### A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple in-stallation as described in catalog. Choice of Monei mesh sixes range from coarse 30 to fine 200.

### FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS

Marvels most recent development is a filter for the efficient filtration of all types of fire-resistant Marvels most hydraulic fluids



WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

# As in the past, Marvel continues to offer IMMEDIATE DELIVERY. MARVEL ENGINEERING COMPANY 7227 N. Hamlin Ave., Chicago 45, III.

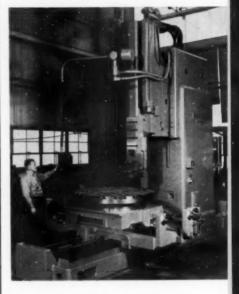
IMMEDIATE DELIVERY!



	THORIE. Somper G-GGES
MARVEL	TE- Without obligation, please send me complete data o
A STATE OF THE STA	Marvel Synclinal Filters, as follows:-
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	Catalog #200-For Fire-resistant hydraulic fluids
	Catalog #301—For Water
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on WATER	Address
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	State
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from the push-button station of the machine. Two-speed traverse is available, enabling the operator to position the work to a few thousandths, without manual movements, although manual control of all movements is available from either side of the machine.

A built-in dividing head is arranged for power operation. A predetermining counter automatically stops the table, for any selected number of turns, within one-tenth of a revolution. Position of upper and lower reverse dogs on the



ram may be changed from the pushbutton station, enabling the operator to lengthen or shorten the stroke without using levers or cranks. The ram may also be locked from a button on the pendant.

The pendant is a counterbalanced design, swinging 240 deg. The ram may be tilted 10 deg. The toolholder is arranged with auxiliary clamping surfaces for maximum efficiency in holding the slotting bar.

Rockford Machine Tool Co., Dept. L, 2500 Kishwaukee St., Rockford, Ill.

T-5-1761

# Composite Pressure Switch

A new unit which combines two pressure switches in one may be used to signal when pressure rises or falls to danger zone and then to shut down the system if pressure continues to rise or fall. The manual reset is so arranged that the system cannot be reactivated until pressure has returned to a safe

Each switching element in the unit can be electrically independent of the

other; if necessary, one can be a-c while the other is d-c. Otherwise, two external leads can be supplied to control a single circuit between maximum and minimum pressures.

This Meletron pressure switch, designated model 432, comes in three classes of proof pressures: 6, 30 and 120 psi, with an adjustable range from 0.05 to 100 psi.

Barksdale Valves, Pressure Switch Div., 5125 Alcoa Ave., Los Angeles 58, Calif. T-5-1771

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seismic free-in-space unbalance indicator attached to work-supporting mountings on chrome balls and raceways which provide over 4 in. of free amplitude travel. In addition to the heavy loads this type of design permits, its use in combination with variablespeed power drives enables the operator to correct large amounts of unbalance at low, safe speeds.

Raydyne Corp., 920 W. Laurel St., Springfield, Ill. T-5-1773

# Surface Grinder

A specially designed double-column surface grinding machine, manufactured by Unicum Inc., Fr. Schubertlaan 60, Heemstede, Holland, uses interchangeable 8-in. grinding wheels for producing varying degrees of rough and fine work. Double column assures grinding accuracy and prevents wear during vertical movement of the grinding arm. A handwheel mounted atop the inner column raises or lowers the

# Gun Drill

A recently developed tube reamer type gun drill is particularly adaptable to valve guide hole drilling and other work where hole size, roundness and straightness must be held to strict specifications.

The drill, two-thirds cylindrical in shape, is an end cutting tool with a single cutting edge. It cuts a true round hole while rotating in the workpiece. Oil, acting both as a coolant and



lubricant, is forced through the shank and flushes chips out through the single flute without retraction.

With proper setup, maintenance and careful regulation of speeds and feeds, secondary operations are unnecessary. Resultant high quality of the drilled hole makes spot inspection adequate.

Finishes of from 20 to 100 microinches, rms, are possible, depending on requirements. Drills are available in varied lengths and diameters.

Eldorado Tool and Mfg. Co., 342 Boston Post Rd., Milford, Conn. T-5-1772

# **Balancing Machine**

The new Mogul balancing machine is designed for mechanical simplicity of complex balancing operations. The pedestal type units may be placed together or used separated according to the length of the piece to be balanced. Drive unit may be positioned at either end or in the center.

To locate and measure conditions of unbalance, the Mogul employs a true





tools. There is an experienced Seibert representative

in every key industrial area to work with you in solv-

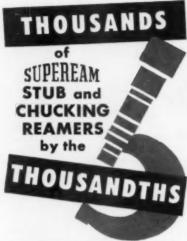
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SEIBERT & SONS, INC. CHENOA, ILLINOIS

Quality Multiple Drill SPINDLES AND PRODUCTION TOOLS

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ROUTE 176 and BRADLEY ROAD BOX 429 TE, LIBERTYVILLE, ILL.

grinding arm, and a micrometer scale under the handwheel provides highly accurate readings to 0.008 in. vertical feed. The latter scale is adjustable in every position and is self-braking.

For horizontal movement, tapered adjustable roller bearings enable the outer column to revolve easily around the stationary, inner column. Leather

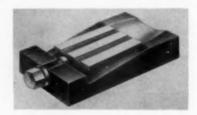


covers protect the inner column, and a fully enclosed  $1\frac{1}{2}$ -hp a-c motor powers the unit.

Information available through Netherlands Trade Commission, 551 Fifth Avenue, New York 17, N. Y. T-5-1781

# Leveling Jack

The Empco style JD-O leveling jack for use with medium-weight machines, and production and toolroom equipment has a lifting capacity exceeding 3000 lb. It is composed of three basic



parts: machine support base, cradle and adjusting screw. Its design incorporates features of self-alignment, to compensate for uneven floor surfaces up to 5 deg. It measures 6 in. long,  $3\frac{1}{2}$  in. wide,  $1\frac{1}{8}$  in. minimum height and provides lift adjustment of  $\frac{1}{4}$  in. Total weight is 5 lb. The unit is available equipped with vibration-absorbing felt pads to reduce machine and floor vibration effects.

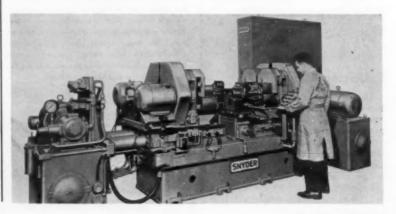
Enterprise Machine Parts Corp., 2731 Jerome, Detroit 12, Mich. T-5-1782

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# **Precision Boring Machine**

An eight-spindle, two-way precision boring machine finishes 19 different semimass-produced parts with a variety of bore sizes and center distances. Two fixtures enable the boring of up to four holes at each fixture location and the production of a finished part with each cycle of the machine. Each two-spindle boring head is a separate slide unit

and can be operated manually, automatically, individually or in combination with other heads in an automatic machine cycle. Two speeds can be had on the lower spindle of each head and three speeds are possible for the upper spindle by adjusting belts. A timing belt is provided on the low speed spindle to avoid any slippage of the drive. A finished part can be produced in an automatic cycle in 50 seconds,



floor-to-floor time, on the electricallyoperated hydraulically controlled machine.

Belt-changing devices enable quick spindle speed changes for various bore sizes. Magnetic chucks in the work-holding fixtures give maximum work-holding flexibility without need for clamping details. Fixture heights are adjusted with quick-change spacers. Gage blocks are provided for adjusting the various parts to correct lateral location. Micrometer steps provide depth control for each head. The boring heads have index pins that enable quick adjustment of hole center line angular location. Center distance of spindles is adjusted with spacers.

Electrical controls for the machine are in a control panel at the rear. All pushbutton controls are in a compact panel at the operator location. The Snyder two-way precision boring machine occupies a floor space about 15 ft by 5 ft and is 5 ft high over-all.

Snyder Tool and Engineering Co., 3400 E. Lafayette Ave., Detroit 7, Mich. T-5-1791

#### **Deburring Tools**

The Ellipti-Burr is designed for the deburring and chamfering of accessible hole faces having irregular surfaces.

The new self-piloting tool is a twolipped cutter, which automatically follows any hole surface geometry. The pilot is conical and accommodates any hole size within its working range. The cutter blade, with two diametrically opposed cutting edges, is supported to permit both radial and axial displacement.

Operating speed within the range of 75-200 rpm is recommended, depending on the individual operation and type of material. Tools may be operated by portable air or electric drill motors, or in a machine tool spindle, and are readily adaptable to multiple-spindle operation.

Nobur Mfg. Co., Dept. TE, 6860 Farmdale Ave., North Hollywood, Calif. T-5-1792

#### Plastic Vacuum Forming

Model 12 Pak-O-Vac is specially designed for plastic forming, drape forming and vacuum packaging. The compact, sturdily constructed unit is suitable for either production or experimental use. No special training is required to operate this completely self-contained semiautomatic machine. It utilizes 230-volt, 60-cycle power.

The unit accommodates a wide va-

hen a line of automatic welders for DC or AC operation...

That as the most sensitive controls for fast starting and uniform welds...

et is easiest to adapt to any fixture...

buy anything
but
LINCOLNWELD
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welding



AUTOMATIC Lincolnwold fabricates assemblies on automatic welding cycle to turn out . . .

# AUTOMATIC TORQUE CONVERTER HOUSINGS

... at 60 an hour

HERE fast, efficient assembly of front and rear halves of outer cases is being accomplished at low cost with continuous circumferential welds using Automatic Lincolnweld. The halves are loaded on the fixture and indexed into position. As the start button is pressed, the electrode wire feeds down automatically, contacts the work, the flux starts to flow, the arc is struck and the welding continues at a predetermined speed. During the welding cycle, the previously welded assembly is removed from the alternate station and the next assembly to be welded is loaded.

Have Lincoln show how you can reduce cycle time and eliminate scrap with Automatic Lincolnweld. Write for Bulletin SB-1355.

#### THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

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iety of products without special setup and handles a broad range of plastic sheet materials and noll films

Two electric timers are employed for preheating and dwell cycles to avoid operator guesswork. After determining the preheating and dwell times, the operator need only insert parts to be packaged. The machine automatically repeats the packaging procedure. An indicator lamp informs the operator when the dwell cycle is completed.

Using 3000-watt heaters, the Pak-O-

Vac has a vacuum pump of 4.5 cfm capacity.

Product Packaging Engineering, 5747 Marilyn Ave., Culver City, Calif. T-5-1801

#### Gage

Circular form tools may be accurately sharpened without complicated fixtures, by means of the recently developed Sperco gage. It is designed for fast, accurate sharpening in both offhand and machine grinding methods.

The gage attaches easily to all circular threaded or nonthreaded form tools, and indicates the correct cutting angle automatically without charts,



measuring or scribing. It remains attached to the tool throughout entire sharpening operation.

There is a Sperco gage, with top rake angles from 0 to 25 deg., to fit the specifications of every automatic screw machine and turret lathe. The standard model Sperco gage provides 0, 5 and 10-deg top rake angles.

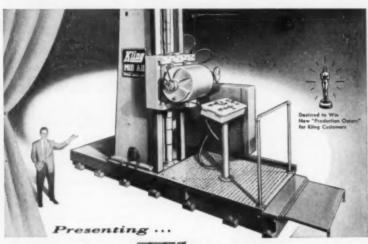
Sperco Tool Co., Dept. F-41, 2318 St. Clair Ave., Cleveland 14, Ohio. T-5-1802

#### Press Brake

A 12-ton model with 48-in. length of bed and ram has been added to the hydraulically operated Di-Acro press brake line.

Called Model No. 18-48, prime advantage of this machine is stroke control: the most practical length of stroke for each job can be preset with the shortest length of stroke usually giving greatest production efficiency and safety for the operator.

Ram of the unit is mechanically linked to a camshaft, which is turned by power being applied to a rotary hy-



### the New Mill

... does more facing jobs faster and at lower cost!

This new high speed face milling machine by telescoping tubular brass covers; Nonoffers exceptional power and capacity, is simply designed, easy to operate and enduringly built, as demonstrated by these construction details: Primary construction, welded steel; Vertical feed screw protected

metallic ways used on both horizontal and vertical ways; Telescoping steel covers used to protect horizontal ways; Motor mounted on slide which provides for 10 inches of in-and-out travel of cutter. Send for data.

#### How this new machine Outperforms all others;

Some of its jobs	Faed Rates	Metal Removal Rate	Horiz. Cutter Travel	Vert. Culter Travel	Me	Mars
Faces structural steel beams and columns and other steel sections and fabrications. Faces steel and iron castings, forgings, wield mants, die blocks, etc. Does plate edging: can chamfer plates and bars (titting head model) and can be adapted to mill aluminum and other nonferrous metals.	(Horiz, and Vert.) 40" and 80" per mia.	Up to 60 cu. in. per min.	4 sizes 72" to 144"	3 sizes 60° to 84°	3 H.P. Horiz, and Vert. Gaer Head Feed Motors with Brake	40 H.P. Spindle Moto Direct Drive 75 H.P. also available

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BROS. ENGINEERING WORKS 1320 N. KOSTNER AVE. • CHICAGO 51, ILLINO18 sive Canadian Distributer: Brewn-Boggs Foundry & Machine Co. Ltd., Hamilton, Onl. Export Distributor: Simmons Machine Tool Corp., 50 E. 42nd Street, New York 17, N. Y. ers of Friction Saws; Shears, Rotary, Double Angle and Guillo

Send for Bulletin 100 for Data on these Kling Metal Working Machines















draulic cylinder. Oscillating action of this cylinder has a maximum movement of 270 deg. Stroke length can be adjusted, without having to readjust the bed or die settings.

The ram always works off the bottom of the stroke, hence full pressure is always developed regardless of the length of stroke.

Rate of 60 spm is obtained on a \(^1\)4-in. opening, while at the full opening of 1\(^1\)2 in., the rate is 25 spm. Regardless of the stroke rate, the ram and die always enter the material at constant speed so that there is no whipping of the material. Ram is also sensitive to inching and can be backed off at any point in the operating cycle by touching a reverse lever and using the foot control.

A constant flow of power through the hydraulic system avoids jamming. An adjustable relief valve can be preset to apply only the maximum tonnage required to bend or punch the material.

Standard equipment includes a back gage which is adjustable both vertically and horizontally.

O'Neil-Irwin Mfg. Co., 625 Eighth Ave., Lake City, Minn. T-5-1811

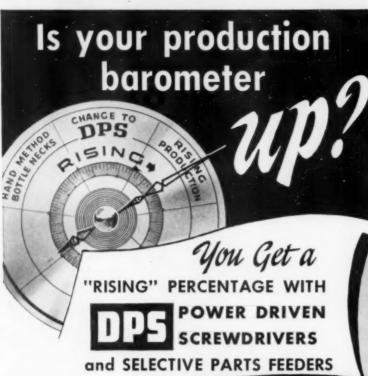
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#### Hydraulic Milling Unit

A new 3-dimensional, hydraulic milling machine, that operates with a constant horsepower, features an all-hydraulic spindle, with infinite speed selection.

This machine, designated the 3-D Hydro-Cycle Miller, will mill left or right, forward or back, and up or down. It will cut circles to within 0.0002 in. while closer tolerances are readily held





#### Widely Adaptable to Individual Requirements

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5 SCREWDRIVING MA-CHINES, Bonch and Pedestal types. Model A pictured.



### DETROIT POWER SCREWDRIVER CO.

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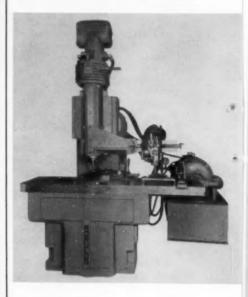
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in the finishing of deep cavities and pockets. Because it semifinishes the die or part, bench-work filing is minimized.

Vertical, cross and longitudinal movements are synchronized and controlled through a pencil type stylus arm. All movements are manually controlled merely by guiding the stylus arm over the surface of the die or part which is to be duplicated.

This machine is ideal for milling aircraft structural members, whether they are made of aluminum or the tougher metals. This new machine is, likewise, a tremendous cost saver on any smalllot production job.

The Romulus hydraulic milling heads



used on this machine can be adapted to serve special needs. They can be mounted in any position, and they operate accurately at any angle. The hydraulic spindle has a speed range of from 200 to 2500 rpm, with infinite speed selection. Standard heads are available up to 50 hp; over 50 hp, heads are available by special order.

Romulus Tool & Engineering, 13581 Huron River Dr., Romulus, Mich.

T-5-1821

#### Level-Angle Finder

This pocket-size combination level and angle finder quickly and accurately gives exact measurements of angles of work in progress on grinders, drill presses, shapers, millers and similar machine tools.

Useful for either setup work or inspection, this dual-purpose device is light and durable. A precision tool, it



has jeweled needle balance, is shockproof, dustproof, antimagnetic and unaffected by temperature changes. There are no springs or steel parts.

Jiffy Tool Supply Co., 109 E. 9 Mile Rd., Ferndale 20, Mich. T-5-1831

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#### Micro Hole Drill Unit

Difficult hole drilling to 0.001 in. may be accomplished quickly and efficiently with this new microdrill unit. A magnetic chuck feature makes the drill highly efficient and easy to use. Collets, which are used with this com-



ponent, take most commercially available micro-drills with shank sizes of 0.030, 0.040 and 0.061 in., avoiding need for special drills. Two magnetic drivers are provided to fit into the chuck with a drill holding capacity of 0.001 to 0.006 in. on the smaller, and 0.007 to 0.020 in. on the larger. Drills are inserted into the collets and placed against the magnetic driver which holds these assemblies in drilling position. Runout is easily and instantly corrected to provide perfect concentricity

Greatest new tool in years for maintenance and production

a high quality, low cost

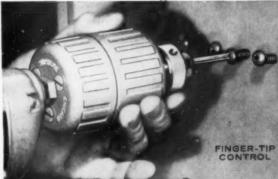
#### REVERSIBLE

SPEED REDUCER

Fits all portable drills ... reduces speed, increases torque seven times. Ask your distributors to show you the ...



PROFESSIONAL MODEL No. 4000-P With Yankee type bit holder



COMPLETE 14-PIECE SET ... ONLY \$24.95

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### **TAYLOR**



# Sensitive Precision DRILLING MACHINES



### New! New!

NOW! Taylor HI-EFF offers you a new "C" Series Sensitive Precision Drilling Machine priced considerably lower than the well-known "A" Series, yet containing most of the quality features found in the "A" Series machines.

Write for Bulletin 182.

### AUTOMATIC FEED NOW AVAILABLE

Automatic Feed attachments for small hole drilling are now available for all Taylor HI-EFF "A" Series and "C" Series machines. Easily Adaptable!

# TAYLOR DYNAMOMETER and MACHINE COMPANY

DYNAMOMETERS 

BALANCING MACHINES

DRILLING MACHINES

6411 River Parkway, Dept. TE, Milwaukee 13, Wis.
INTERNATIONAL DIVISION—DUMMANN WORLD
TRADE CO., Milwaukee 6, Wisconsin, U.S.A.

of rotation.

A calibrated micrometer depth control, employing a knurled feed ring, permits positive stop at exact depth required within 0.0002 in. It provides a means for drilling blind holes to close tolerances. Feed may be regulated to a few thousandths of an inch or less at each pass of the drill.

The built-in standard two-way table travel eliminates setup time between holes. Table travel is quickly adjustable from 0 to 1½ in. both front to back and side to side. Two large, easy-to-read dials indicate travel. The table is also drilled and tapped for holding fixtures. Three-way table travel is provided in effect, as the desired hole is developed by constant upward feed of the work to the drill. Adjustable counterbalances offset weight of table and fixture.

An adjustable auto transformer for voltage control is furnished to provide 2,000 or less rpm. A ten-power viewer and spotlight pinpoint the work. Motor speed is adjustable from 0 to 17,000 rpm, which permits selection of correct speed for any drill size up to ½ in.

The Dumore Co., Racine, Wis. T-5-1841

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#### Insert Milling Cutters

Throwaway-insert cutters which never require sharpening, are designed to handle most rough and finish milling operations on cast iron and steel.

The cutters employ low-cost disposable Wessonmetal blades with 8 quickly indexable cutting edges. Design of the



throwaway-insert milling cutter permits high-speed milling at high feeds. Negative radial and axial rake combinations provide ample clearance and give 8 cutting edges on square blades.

Setup or blade indexing is fast and simple because there is no grinding or need for complicated blade adjustment.

The new insert milling cutters can be used with present adapters and ma-

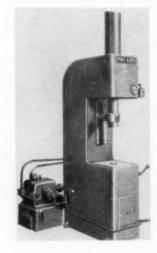
chines. Uniform and positive blade location is achieved by placing a simple ring gage against the cutter face. Blades are then aligned by making contact with the gage and locked in position by taking up on the socket head screw.

For the present, Wesson is engineering these cutters to meet the requirements of individual jobs.

Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich. T-5-1842

#### Gooseneck Presses

Accurate and sensitive control of ram speed, force, travel and direction of movement, through a simple, convenient hand lever or foot pedal are features of these fluid power gooseneck presses. They are designed for speed,



economy and simplified operation with less fatigue to the operator.

Presses are sturdily constructed with three sides open, large daylights and deep working throats. Other features are working height platens, low platens, detachable tables, long adjustable ram travel, sensitive ram controls and efficient, variable-volume pumps.

Tri-City Tool & Machinery Corp., 513 31st Ave., Rock Island, Ill.

T-5-1843

#### Overload Device

An overload device called Automac protects motor-driven machines and tools against dangerous overloads by measuring the electrical input to the motor. From these measurements it computes the mechanical load on the motor. When the load exceeds a preset value, Automac gives a visible warn-

ing and actuates auxiliary equipment to take corrective measures. The unit also permits automatic machines to run unattended.

The simple unit contains only three standard electronic tubes. Maintenance is simplified by the use of a removable cover plate which exposes all components. The entire electronic panel can be quickly removed since connections to it are made by a single disconnect plug.

Cardinal Control Co., Inc., Dept. 332, 34 Meadow St., New Britain, Conn.

T-5-1851

#### Tracer Milling Unit

Ram support of this 3-dimensional tracer milling unit has provisions for mounting auxiliary tooling on all four sides and the end. The tracer stylus arm also has several mounting positions. By moving the cutter rather than the workpiece, it is practical to take numerous cuts on large workpieces.

Transverse and longitudinal movements of the cutter are 12 in. and depth movement is 8 in. All three movements are manually controlled from a single



pencil type stylus tracing unit. A quick shutoff valve permits independent use of any one movement. A micrometer screw depth stop on the cutter head slide affords accurate depth location for the full range of cutter travel. Linear and depth duplicating speed of the cutter is variable within a range of 1 to 50 ipm.

Positive-lock adjustment on all three movements of the stylus enables location of the cutter in relation to the stylus. To allow for changing the tracing stylus size without changing the cutter, a quick-change positive-lock stylus chuck has been provided.

The unit shown has a belt-driven, 3hp head with 4 possible speed changes



#### Infinitely Adjustable

# AC SPEED CONTROL SYSTEMS

FOR INSTRUMENT-



OR INDUSTRIAL-



#### **APPLICATIONS**

WacLine Power Systems provide the economical answer to speed control of AC motors under variable or constant-torque applications. Speed is infinitely adjustable over a wide range. Close regulation is readily accomplished even under varying torque. The WacLine system may be applied to single or multi-phase sources on any frequency from 50 to 1000 cycles. Special features such as Program Control, Voltage Signal Response or independent adjustment of forward and reverse speeds are available.

#### full Regulation with all the Advantages of AC Motors

- From .1 oz/in. to industrial power requirements.
- Longer Motor life with less maintenance.
- Permits the use of open or hermetically sealed motors.
- Applicable to explosion proof motors.
   Equally effective for large and small
- Simple electronic principle, patentpending.



Mirs. of Speed Control Systems—Dummy Leads
Microwave Components—Test Equipment
Photographic Equipment—Medical Equipment

INDICATE A-5-186-1

of 200, 400, 900 and 1800 rpm. Also available is a 3-hp head with infinitely variable speeds between the range of 200 to 1800 rpm. In addition, 5-hp heads of either the 4-speed belt-driven type or the infinitely variable speed type can be furnished.

Sundstrand Machine Tool Co., Rockford, Ill. T-5-1861

#### Press Brake

Model 24-A-412 Connecticut press brake with 24-ton rated capacity has all steel gearing, front-operated variable-speed drive, 1-hp motor and frontoperated gage.

It will bend 4 ft of 12-gage mild steel over a 7/8-in. die. Of sturdy construction, the machine is built for con-



tinuous, trouble-free production.

Bed and ram are 48 in. long and distance between side frames is 32 in. Stroke is 2 in. and adjustment of ram by means of enclosed, worm geared pitmans is  $1\frac{1}{2}$  in. Die space over bed is  $7\frac{1}{2}$  in. with ram down and adjustment set for maximum stroke, and gap is 6 in. deep.

W. Whitney Stueck, Inc., Old Saybrook, Conn. T-5-1862

#### Steel-Cutting Carbide

High-velocity machining at light to moderate feeds is the province of the new steel-cutting carbide, Grade K7H, developed for all types of finishing operations. The grade is especially suited for use in the tracer of profiling applications and is useful on most equipment capable of operating over wide ranges of feeds and speeds.

The new carbide was created to



Name your industry—textile, canning, processing, electronics, chemical, packaging, petroleum, ceramics, metal fabricating. It's bound to be one in which ANGLgear power take-offs have solved right-angle transmission problems again and again.

solve virtually any right-

angle power take-off problem.

Standardized ANGLgear units have won their wide acceptance because they meet design and engineering requirements fully for compactness, light weight and high operating capacity. Designed for either manual or power-operated control systems, they are available in 12 models—with ½, 1, or 3 hp rating, with 2-way or 3-way shaft extensions, and with either 1-1 or 2-1 gear ratio. The right-angle transmission problem that ANGLgear can't solve is rare indeed.

You'll find our literature in the product design file of Sweet's Catalog. Contact your local distributor, or write to us, for additional information.



AIRBORNE ACCESSORIES
CORPORATION

HILLSIDE 5, NEW JERSEY
INDICATE A-5-186-2

The Tool Engineer

stand up under a combination of varying conditions, mainly higher speeds and greater feeds, and to increase the rate of metal removal in areas of finishing and moderately light cutting operations.

It has a hardness of 93.5 R<sub>A</sub> and unusual strength even at high temperatures. In addition, it offers maximum resistance to cratering and high edgewear resistance.

Kennametal Inc., Latrobe, Pa. T-5-1871

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION quirements of AWS Class E-7016.

It features unusually high deposition rate, low slag cleaning time and low spatter loss.

Although recommended for use with d-c reverse current, it can also be used with a-c current. Ultimate tensile strength, as welded, is rated at 80-83,000 psi, yield strength at 70-73,000 psi with elongation of 34 percent in a 2-in. specimen. Impact tests indicate that the deposit, as welded, undergoes a transition from ductile to brittle fracture only below -40 F, giving the LH-2 impact properties suitable for most applications.

General Electric Co., Welding Dept., Schenectady, N. Y. T-5-1873

#### **Four-Station Boring Unit**

With one machine operator, this Model S Bore-Matic borizes 240 refrigerator parts per hour, net production. Borizing operations done on the castiron workpiece are turn OD., face rim and chamfer.

Four hydraulically powered slide units are mounted on scraped base pads, each slide unit carrying two boringheads and a single motor-drive arrangement. Hydraulic pressure is supplied to the slides by a 30-gpm hydraulic power unit mounted at the rear of the machine. Rotating air-operated, centrifugally damped, work-holding chucks mounted on the boringhead are inter-

#### Liquid Springs

Compact, self-contained liquid "springs" function because of liquid compressibility and have been designed for use in dies. An internal hydraulic levering principle designed into these Liqui Springs permits them to develop, with an identical or greater stroke, up to ten times the force of a standard heavy-duty coil spring of the same diameter and length.

The unit illustrated, ¾ in. in diameter and 2½ in. long, plus mounting



stud, has a %6-in. stroke with a 600-lb preload and an end force of 2000 lb.

As an economical feature, they permit simultaneous operations on the press. They also require fewer drilled and tapped holes than conventional springs.

Liqui Springs with standard mounting threads are preloaded and completely self-contained, thus do not require stripper bolts and washers.

Taylor Devices Inc., 188 Main St., North Tonawanda, N. Y. T-5-1872

#### Powder Metal Electrode

This new gray, heavy-coated lowhydrogen electrode with powder metal added to the coating, is said to be considerably fasted in lineal speed than conventional low-hydrogen electrodes.

Designated Strikeasy LH-2, the new development meets mechanical re-

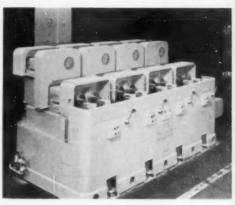




Those who buy tools for lasting performance as well as initial appearance always specify "Nelco". These carbide tipped Milling Cutters are precision built for rugged dependability, engineered to "take it"—singly or in gangs—to save real money, deliver fast and accurate results without the operational and maintenance "headaches" of most conventional cutters. Look for benefits and appearance—call for Nelco—your distributor has the size and type you need in stock.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-188



changeable to accommodate different size parts.

Tool blocks are also designed so that the same tools may be used on different parts. Each of the four work stations is independently operated, two parts being machined simultaneously at each station. Air-operated fixture clamping is done by foot pedal and the cycle is controlled by pushbuttons at each station.

The Heald Machine Co., Worcester 6, Mass. T-5-1881

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

#### Self-Aligning Tube Fitting

A new low-cost self-aligning tube fitting, called Selfalign, can be installed without disassembling. The tubing is simply inserted in the fitting



until it bottoms, and the nut is tightened.

The dual sealing principle assures positive, leakproof connections. The sleeve grips the tubing over a broad area for a surface-to-surface seal, while a thin razor edge and guiding shoulder form a line-to-line seal with the tubing as the nut is tightened.

Suitable for any low and mediumpressure applications using copper and aluminum tubing, the complete line includes union, union tee, union elbow, male and female connectors, male and female elbows, male tees for pipe on run and pipe on branch.

Tube fitting is available from stock in 1/4, 1/4, 1/4, 1/4, 1/4 and 1/2-in. sizes in brass; aluminum fittings are special

The Weatherland Co., Fort Wayne Div., 128 W. Washington, Fort Wayne, Ind. T-5-1891

#### Alloy Die Steel

A new medium-carbon-alloy die steel, called MC-Mold and Cavity steel, is especially designed for molds and cavities where good surface finishes are desired. The new steel can be uniformly deep hardened from 300 to 350 Bhn throughout sections as large as 20 x 10 in. High surface hardnesses are obtained by carburizing and then oil quenching. A low heat-treating temperature is used in this process so that little or no movement takes place during quenching.

MC-Steel is available either annealed or heat treated to a hardness of 300 Bhn at which hardness it is still readily machinable. It takes a fine finish with little danger of pits caused by metallic inclusions. It also is advantageous for molding clear plastics.

Alloys included in the composition of this new type die steel are carbon. silicon, manganese, chromium and molybdenum.

Vanadium-Alloys Steel Co., Latrobe, Pa. T-5-1892

#### Chucks

A new line of three-jaw compensating power chucks, the Series 13100-A is available in 8, 10, 12 and 15 in. rated sizes. Designed for direct mounting on American Standard types A-1, A-2, B-1 and B-2 flanged spindle noses, these chucks are used to drive work on centers when high-speed, heavy-duty cuts are required. The high-speed tool steel center fits a standard Morse taper hole in the center plate.

The 8 in. chuck features 1/16 in. compensation, and the 10, 12 and 15 in. chucks have ½ in. compensation, per jaw, sufficient for gripping castings, forgings and other rough materials which have normal variations in size and errors in centering.

The compensating action is achieved through three levers and a floating rocker. When power is applied, the draw bar pulls the rocker which actuates the three levers and three jaws. Equal pressure to all jaws is assured,



regardless of their gripping position on even or uneven work.

Skinner Chuck Co., New Britain, Conn. T-5-1893

#### Bond for Diamond Wheels

A new bond called Cera-Met has been developed for diamond wheels. The Cera-Met wheel does not glaze if carbide and steel are ground at the same time.

In use, it offers economy, long life with infrequent dressing and unusually fast cutting speed.

The Cera-Met bond wets and adheres to each diamond grain regardless of how fine, gripping it so firmly it must be worn down. After the diamond is worn flat, a breakaway action will release the diamond particle, exposing a fresh diamond edge. This action con-



Want a die set where the dimensions "stay put"? If you do, then you want die sets built by Standard.

After completion of rough machining, all Standard catalog back post steel die sets are slowly heated to 1550°F., thoroughly soaked at that temperature for 3 hours, then slowly cooled back to room temperature, thereby removing all residual stresses.

RESULT: Then and only then can you have the assurance that the precision tolerances of the matching bored holes, the parallelism of the working surfaces, and the precise workmanship of

the tool and die maker — are not lost through instability of the steel itself.

STANDARD DIE SET MANUFACTURERS, INC.
Providence 7, Rhode Island



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Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized, precision - machined castings-7 standard sizes.







Standard's Box Jigs are made in either square or rectangular styles in 9 sizes. It will pay you to have them on hand in several sizes,

#### MILL FIXTURE BASES

Mill Fixture Bases are available in a variety of sizes. All are normalized and precision-machined. They are furnished with either standard keyways, or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost.







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illustrating our complete line of top quality jig and fixture parts.



**AUTOMATION NOTE: Also Custom-Built Precision** Parts for Automation Tooling, Ask us,

#### STANDARD PARTS

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INDICATE A-5-190

tinues throughout the life of the wheel so that the grinding surface remains clean and sharp.

Clipper Diamond Tool Co., Inc., 21G W. 46th St., New York 36, N. Y.

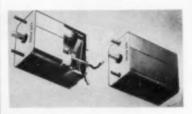
T-5-1901

#### Rectangular Motors

Rectangular shaped motors, designed to give the same output as comparable conventional round motors but in significantly less space, are available in 6, 12, 24 and 32-volt ranges with outputs up to 140 oz-in.

The motors feature all-welded construction with 3/16 inch thick stampings for maximum stability and resistance to twisting, and to prevent armature misalignment.

Broad flat surfaces of the motors permit installation in any position. The shaft can be extended from both ends for double load application. Mo-



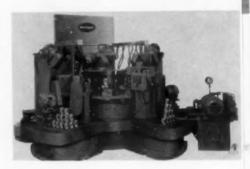
tors can be made waterproof, and large sintered bronze bearings at each end of the shaft eliminate the necessity of oil wick reservoirs.

Leece-Neville Co., 1374 E. 51st St., Cleveland 3, Ohio. T-5-1902

#### Special Drilling Unit

This new machine, which finish drills 1200 pistons per hour, performs 10 separate operations on each piston during each cycle of the machine. It finish drills 4 angular holes and 6 horizontal smoke holes.

An 8-station, horizontal and angular, dial type machine, it features an automatic hydraulic index table and individual, automatic indexing fixtures. Attached to the 42-in. hydraulic index table is a mounting plate, 60 in. in diameter. Fixtures make it possible to drill both



the angular holes and the horizontal smoke holes on the one unit Completed pistons are ejected automatically at the 8th station.

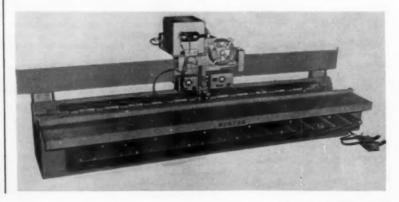
There is also hydraulic power clamping of fixtures, and fully automatic clamping and cycle control, from station to station. Construction meets JIC hydraulic and electrical standards. Lubrication throughout is automatic.

Michigan Drill Head Co., P. O. Box 4643, Detroit 34, Mich. T-5-1903

#### Stake Welding Machine

Flat stock of all types up to 1/4 in. thick can be handled by this special stake welding machine which is a modification of the Morton standard Model A stake welder. The new unit is designed for automatic arc welding and provides considerable savings in material usage.

This welding machine includes sideloading platforms with ball transfer rolls to aid in material handling. Standard features such as positive clamp-



ing, accurate gaging, and water-cooled copper backup bar are designed and built into the unit.

Morton Mfg. Co., Broady & Hoyt, Muskegon Heights, Mich.

T-5-1911

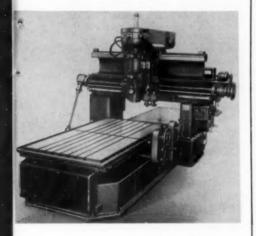
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#### Profile-Miller

A recently designed profile-miller, the #50MA, is available with tables from 4 x 4 ft, in increments of 2 ft, up to 12 ft. Additional widths and lengths are available.

The spindle, which has provision for 18 speeds from 44 to 4800 rpm, is driven by a 40-hp motor.

The machine is equipped for hand profiling of ferrous and nonferrous



metals. Also available are power feeds with speeds up to 320 ipm, power feeds for transverse movement, vertical tracing, 360-deg tracing or three-dimensional tracing systems.

The machine illustrated is equipped with power feed to table and infinitely variable feeds from 0 to 160 ipm.

Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y.

T-5-1912

#### **Tap Drivers**

Safe-Torque tap drivers have been developed to accommodate a wide range of tap sizes and provide accurate torque adjustment to suit varied operating conditions.

They are designed to prevent or reduce tap breakage. An operator need not slow down for blind holes, and there is no noise or impact on release. High



Rivets are small, but they can create "kingsize" headaches when they aren't at your assembly line in the quantity you need when you need them.

To give you unmatched delivery service on tubular rivets, Milford has five manufacturing plants and twenty sales offices strategically located across the country's industrial beltline.

To cut delivery time and production costs, to improve product appearance, to assemble your product on automatic rivet-setting machines—get in touch with Milford!



#### MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT . HATBORD, PENNSYLVANIA ELYRIA, OHIO . AURORA, ILLINOIS . NORWALK, CALIF.

tapping speeds with increased production are possible because these drivers operate at any speed taps can take.

A preset torque remains constant, giving dependable control under all conditions. "Free wheeling" release action helps to produce uniform, accurate threads. If the driver releases before the hole is completely tapped, operator is thus warned to check for a dull, soft, improperly sharpened or wrong tap for the job, a faulty hole, or a change in material.

Standard Safe-Torque tap drivers are

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for special indicator

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designed for use on any machine with a reversible spindle (except transfer machines, drilling heads and automatics with lead screws which require special drivers with compensating springs). Adjustment of torque is simple because every driver is marked with a "normal"

REDUCE SPECIAL GAGE COSTS

AVAILABLE FROM STOCK

AT POINT OF DESIGN

and "high torque" setting for each tap size. The optimum torque setting for maximum tap life and accuracy depends on a variety of conditions including material, coolant and finish, and has to be established by actual experience on the job.

Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, Ill. T-5-1921

#### Tachometer Takeoff Heads

Speeds of 5,000 to 30,000 rpm, or low speeds of 1/2 to 100 rpm can be measured by means of these tachometer takeoff heads (Series 33), used with Metron indicators. Sturdy construction assures long life under continuous industrial operation. No brushes, slip rings or other parts that need regular maintenance or replacement are used.

A double-pole, double-throw (dpdt) switch together with a capacitor acts as a speed sensing element. This element is operated by built-in gearing whenever the takeoff shaft rotates in either direction. It produces a current exactly linear with respect to speed. Over-all tachometer accuracy is excellent since inaccuracy due to the takeoff head is eliminated for all practical purposes. Additionally, these takeoff heads permit multiple-range tachometers with a wide total range.

The takeoff heads must be combined with an indicator because they use a dpdt switch and not a generator.

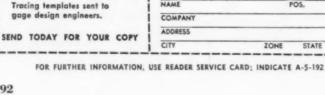
Metron Instrument Co., 432 Lincoln St., Denver 3, Colo. T-5-1922

#### Belt Grinder

Recently developed universal airpowered portable belt grinder can be used as a standard grinder by presenting the contact wheel to the work, and is capable of grinding light weld beads and solder joints, deburring large parts and performing polishing operations.

Slack-of-the-belt can be utilized for polishing contoured parts. When the platen is mounted, flat grinding operations can be performed. It also is designed for mounting on a lathe from the back cross slide for polishing cylindrical parts, or it may be bench mounted for offhand grinding, polish-







ing and deburring on the contact wheel. Handles, guard and platen are all

Handles, guard and platen are all reversible to make either a right-hand or left-hand grinder.

The belt is powered by a 1½-hp air motor. The standard grinder is furnished to use 1½ in. wide x 42 in. long, or 2 in. wide x 42 in. long abrasive belts.

Abrasive Machinery Corp., 432 S. Pennsylvania St., Indianapolis 25, Ind. T-5-1931

#### Direct Reading Force Gage

A hydraulic type force gage measures the force between electrodes on spot-welding machines, or between rolls on roll welders. It also makes compressive tests—useful on forming, dimpling and upsetting operations—and can be used for weighing.

Insulated contact surface prevents damage from accidental firing of welding equipment while force measure-



ments are being taken. Correct electrode pressure can be duplicated with the gage for any job without numerous sample welds.

The gages are available in 5 ranges of standard capacities: 0-1,000, 0-6,000, 0-10,000, 0-20,000 and 0-40,000 lb. Other ranges may be had on special order. The 3½-in. gages read directly in pounds, and are accurate to 1 percent.

Thickness of hydraulic units at load point is  $1\frac{3}{4}$  in.; body diameter is  $4\frac{5}{8}$  in.; net weight is  $8\frac{1}{2}$  lb.

Webster Instrument, Inc., 11856 Mississippi Ave., Los Angeles 25, Calif. T-5-1932

#### Angle Finder

Fast checking of carbide and highspeed single-point tools is possible with a protractor designed for simple operation. There are only four moving parts in the complete instrument which will check cutting edges, top rake and also side clearance angles.

It is self-aligning and will accurately

# ACCO products

# Wilson "Rockwell"\* Hardness Testers

# Production line speeds with laboratory accuracy

• There is a WILSON "ROCKWELL" \* Hardness Tester to meet every requirement—from laboratory testing to automatic testing at the rate of 1000 pieces per hour.

#### J Model Manually operated

Supplied in both NORMAL and SUPERFICIAL testing types. Designed for testing tools, machine parts and all ferrous and non-ferrous metals, hard or soft, except thin sheet steel.



#### Y Model Motorized

Suitable for testing work now being done with J models when it is advisable to increase testing speed. Motorized mechanism removes the major load in the test cycle. Set-O-Matic Dial Gauge eliminates need of manually setting dial gauge to zero.



#### **Fully Automatic**

Executes complete test cycle automatically at the rate of up to 1000 pieces per hour. Will classify tested parts as "correct," "too hard" and "too soft." Controls hardness limits within two Rockwell numbers. Has safety stop if pieces are not fed properly.

A wilson hardness testing expert is located near you. Save time and money on your Testing problems. Write or call today.

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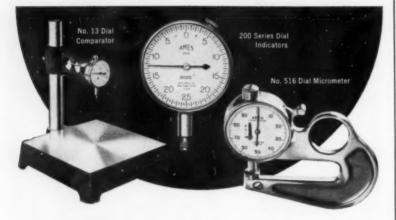
#### WILSON "ROCKWELL"...

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### ... the preferred on every job

Ames instruments have been making industrial measurement history for more than half a century. Extremely adaptable, they have solved hundreds of tough measuring jobs while providing unquestioned accuracy through many millions of cycles. Ames indicators and gauges enjoy a reputation as the finest you can buy...simply because we have *always* employed expert craftsmen and the highest quality materials.

We will gladly make recommendations on your measurement problems. Please send prints and specifications. And ask for your free copy of the Ames catalog.

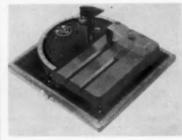
Representatives in principal cities



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project any angle quickly. It can be used in sequence by different operators because there is no setting for tools of different sizes.

It has a capacity for checking cutting angles on tools up to 2½ in. high, and rake and clearance angles on tools up to 1¾ in. high. Top rakes may be



checked on any angle from the cutting edge. Works equally well on right or left-hand tools.

All checking is done by using only one side of the tool shank which prevents accumulative error.

Precision Tool Co., Muskegon, Mich. T-5-1941

#### Wire Marking Unit

Continuous indentation marking of codes, inspection data and other identification on bare rectangular or round wire may be accomplished with the new Model No. 245 wire marking unit.

Free rolling and motivated by friction drive, it is mounted at the discharge end of a wire straightening machine or other location where the wire is moving during the manufacturing process. Base of the unit is designed for easy installation.

This wire marker will accommodate rectangular wire up to  $\frac{5}{4}$  in. wide by  $\frac{1}{4}$  in., and round wire up to  $\frac{1}{4}$  in. diameter. It is equipped with two self-



The Tool Engineer

centering, adjustable guide rolls, a backup roll and a 4 in. diameter marking roll to produce an impression approximately every 12 in. Impression depth can be controlled from 0.002 to 0.003 in. with characters of ½2 or ½6 in.

The No. 245 can also be equipped with a mortised marking roll to hold single or multiple-character engraved steel inserts. Separate sets of rolls are necessary to mark flat and round wire.

Jas. H. Matthews & Co., 3923 Forbes St., Pittsburgh 13, Pa. T-5-1951

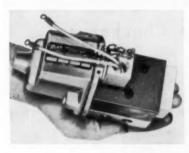
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#### Multipurpose Valve

An adaptable multipurpose valve, engineered for spool valve construction, incorporates virtues of speed, size and weight in a fast operating, compact and lightweight aluminum valve.

Its basic design, which meets JIC standards, provides more than 100 model variations for a wide range of air and oil pressure applications. For example, it can be easily adapted to power a welding gun, air-operated transfer mechanisms, air riveting and testing fixtures.

It completes a valve cycle within 0.033 seconds. With hardened working



surfaces, the valve is engineered and built to tolerances of 0.0001 in.

Identified as the Comet II, the unit is available with ½ or ¾ in. pipe tap for inline, manifold or base mountings; in single solenoid spring return, double solenoid momentary and double solenoid three position. These solenoid direct operated four-way spool-type valve arrangements can be easily used for straight-way or three-way functions by plugging ports.

Small and compactly designed, the valve measures only 7½ by 3½ by 3½ in. Flow capacity is equal to a ¼-in. diameter hole.

Ross Operating Valve Co., Detroit, Mich. T-5-1952



#### **NEVER LOADS THE WHEELS**

K-7 solutions do not load work wheels, and this important advantage means (1) fewer dressings, (2) longer wheel life and (3) a true ground finish (rather than a burnished or smeared finish). In addition, with K-7 (because it does not load) you can often use a harder (1-2 grades) and finer (10-20 points) grit wheel, resulting in better work at lower cost.

Investigate K-7 for use in grinding all steels, cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. (Not recommended for non-ferrous metals.) It is an all-chemical water soluble liquid concentrate, transparent and colorless in solution. It is non-foaming and runs absolutely flat under all conditions. Low pH (alkalinity) makes it easy on the skin. Send for details.

#### **CONCENTRATION TEST KIT**

With this pocket size Concentration Test Kit K-7 users can check the concentration of the solution right at the machine. Only takes a minute or two.

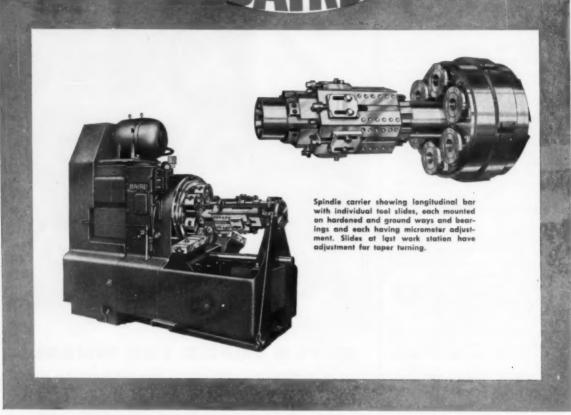




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# ...ask BARD about it



#### Why the preference for BAIRD Chuckers?

Aside from the fact that the Baird 76-H Chucker has enough outstanding design features and advantages to fill a 12-page brochure (which we will be glad to send you on request), there are two main reasons for its popularity.

One is the unique versatility in tooling provided by an essentially simple, "clean" design which at the same time permits exceptional scope in variety and sequence of operations and cycles . . . including complete automation.

The other is the manner in which Baird Engineering tackles an *individual* customer's problem. Here you get the benefit of our years of work with the nation's top high-production specialists . . . a staff of chucker experts, backed by exceptional tooling and test facilities. When a Baird Chucker reaches



An example of versatile Baird 76-H
Chucker tooling for finishing a die cast aluminum end plate, single-indexing, including recessing tool for back-facing... high speed boring heads, two-spindle lead screw tapping attachment. Production: 420 pieces per hour.

the production line, promised performance can be achieved . . . and manitained.

Our case history files almost certainly contain the start of a profitable answer to YOUR problem in high-speed repetitive production. Before you decide on methods or machines, if will pay you to "Ask Baird About It." Write Dept. TE.

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38A56



#### Reactor for Industrial Research Nears Completion

Nineteen industrial companies are participating in the nuclear reactor research program at Armour Research Foundation of Illinois Institute of Technology. The reactor, first in the nation designed specifically for industrial research, is nearing completion on the Illinois Tech campus. The cooperative venture in which the firms have joined, is calculated to determine how nuclear research can be of value in their operations.

As an instrument of research, the reactor will make it possible to:

- 1. Study influences of radiation on chemical reactions, plastics, glasses, organic systems and certain metallic alloys.
- 2. Study effects of radiation in biological systems.
  - 3. Make chemical analysis through

neutron activation; the most sensitive method for measuring impurities in rare quantities.

- Study structure analysis potentially more powerful than standard x-ray diffraction techniques.
- Produce short-lived radioisotopes useful in diagnostic and tracer techniques.

Under the participator plan, each of the firms is contributing \$20,000 toward construction and initial operation of the reactor facility. Armour Research is providing the remaining funds. The companies then will share in the benefits of an extensive three-year program aimed at applying atomic techniques to industrial problems. They also may expect to obtain detailed technical advice, certain patent benefits and limited specialized training.

southern states, is now producing cold rolled strip on a mill parity basis for large and small users. The high speed process provides for supplying tempers of strip in a full range from dead soft to a No. 1 hard temper, and also provides for increasing strip finishes in the ranges through a No. 1 dull finish to a No. 2 regular bright finish.

#### V V V

Work is progressing on a new \$1½-million office building in Riverdale, Ill., for Acme Steel Co. The structure will house all remaining offices and the personnel now located at 2840 Archer Ave., Chicago, making is possible to consolidate all Acme Steel operations at the single location. It is expected to be ready for occupancy late this year.

#### VVV

Construction has started on a new building at Bryand and 4th in San Francisco to serve as showroom, sales office and warehouse for General Controls Co.'s branch in that city.

#### name change

Trundle Engineering Co. has changed its name to Trundle Consultants Inc. According to Robert C. Trundle, president of the organization, his firm has outgrown the original name and the new designation more accurately recognizes and identifies the company's services.

#### new companies

Swift Tools Inc. has been formed to manufacture a line of power operated precision tools. Prime tool in the line which prompted establishing of the facility is the Nelson precision torque wrench, a power operated torquing device.

#### V V V

Impax, Inc. has been established by Universal Match Corp. for production of precision aluminum impact extrusions of high tensile and yield strength. Offices and production facilities for the new firm are located in Ferguson, Mo.

#### V V V

Union Carbide Development Co. has been formed as a new division of Union Carbide and Carbon Corp. Important objectives of the new firm will be long-term corporate planning and evaluation of new business opportunities. Operating divisions of the corporation, how-

#### new facilities

American Chain & Cable Co., Inc. has made plans for establishment of a new branch manufacturing plant at Fairfield, Iowa for its Automotive & Aircraft Div. The new building which is to be erected to house the facility, will have approximately 69,000 sq ft of floor area. It will be completed, according to schedule, by August 1. The company plans to start operations with a labor force of about 50 men, although it will employ about 150 workmen when the plant gets into full production.

#### V V V

A fully equipped welding research laboratory has been unveiled at Worthington Corp.'s Harrison New Jersey division. Consisting of more than 5,000 sq ft of shop space, the new facility is designed to provide Worthington with increased service in application of advanced welding techniques for design and manufacture of their eleven major

products. It will be used for welding application research, designing for welded construction, and building of prototype models.

#### V V V

A new factory has been opened near Independence, Iowa by Micro Switch, division of Minneapolis-Honeywell Regulator Co. to replace temporary facilities occupied by the firm for the past year.

#### VVV

Nielsen Hydraulic Equipment, Inc. has opened a warehouse at 9 Grassmere Ave., West Hartford, Conn. to carry stocks of Parker tube fittings and tubeworking tools and synthetic rubber O-rings for sealing applications.

#### VVV

A new strip mill to process cold rolled strip up to 6 in. wide has been installed in the Cincinnati plant of Solar Steel Corp. The mill, which is calculated to meet the needs of metal fabricators in the midwestern and

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ever are scheduled to continue to carry on their own research and development activities in Union Carbide's major fields of activity.

#### v v v

Open house will mark formal opening of Norton Co.'s new Santa Clara plant May 7 to 9. The facility, located at 2555 Lafayette St., will produce a complete line of grinding wheels, including diamond wheels.

#### V V V

An Abrasive Machine Div. has been established by Beaver Pipe Tools, Inc. With its actuation, two new abrasive cutting machines have been added to the line.

#### V V V

Sheffield Western Sales Corp. has been established as a direct sales branch of The Sheffield Corp. The new office, located at 11323 W. Washington Blvd., Culver City, Los Angeles, Calif., will be under the branch managership of Donald A. Benbow.

#### expansions

Construction has started on two new facilities for Bendix Aviation Corp. at Palmdale, Calif. northeast of Los Angeles. The buildings will be used for testing and servicing of equipment for military air bases and manufacturers of jet aircraft. Initial expenditures for the undertaking will amount to about \$350.000.

#### V V V

A modernization and expansion of its research and development facilities is being undertaken by Marquardt Aircraft Co. at Van Nuys, Calif. Nearly \$6-million has been earmarked for the program. More than two-thirds of the money will be expended for the Jet Laboratory under U.S. Air Force sponsorship.

#### VVV

Production facilities for zirconium will be substantially increased by Firth Sterling Inc. with the installation of a consumable electrode furnace, melting under argon-helium gas or vacuum at its Trafford plant. The new facility will more than double present capacity for vacuum melting of reactor grade zirconium sponge, and will produce up to 2000 lb. zirconium ingots.

#### V V V

Second step in its expansion program has been announced by Holo-Krome Screw Corp. with completion of a new \$350,000 research and development division on the grounds of the West Hartford factory. The new division will engage in development of new techniques and methods for forging of metals, and will also be concerned with development of machinery for secondary operations in processing of various metals.

#### V V V

Another addition to its factory facilities has been completed for Feedall, Inc. to increase manufacturing space by about 35 percent. This is the second addition to be made by Feedall within the past 15 months.

#### VVV

Facilities of the Airmatic Valve, Inc. are being expanded for the third time since it founding. The move into adjacent quarters will triple present facilities. The engineering staff also is being tripled to prepare for additional product items in the valve field.

#### sales

Four new district offices have been opened by The Osborn Mfg. Co. and four of the company's field representatives have been promoted to head these activities. G. B. Pecsok heads the eastern district office, located at 60 E. 42nd St., New York City. P. A. Malling was named to head the western district with offices at 5411 Whittier Blvd., Los Angeles. The Detroit district, under J. H. McGinnis, was opened at 10701 W. McNichols Ave., Detroit. C. William Newman was named to direct the new East-Central district with offices at 5401 Hamilton Ave., Cleveland.

#### VVV

Michigan Drill Head Co. has completed an expansion program which involved setting up 15 new sales representative offices to complete its coverage of the metalworking industry throughout the United States and Canada.

#### VVV

Appointment of Frank W. Jenkinson to the post of district manager in the Cleveland metalworking market has been made public by Adamas Carbide Corp. Mr. Jenkinson has been active in the metalworking field, principally in the automotive and aircraft industries for the past 16 years. He is a member of ASTE's Cleveland chapter.

#### V V V

Opening of their machine tool distributors office in the Highland-Plaza Bldg. at 3387 Poplar Ave. in Memphis, Tenn. has been announced by HoffmanMarquard Machinery Co. R. D. Christman has been made district manager and will represent Cincinnati Lathe & Tool Co., Gallmeyer & Livingston Co., George Gorton Machine Co., Minster Machine Co. and Wells Mfg. Corp. He is a member of ASTE's St. Louis chapter.

V V V

Furane Plastics Inc. has completed arrangements with Permacel Tape Corp. to engage in sale and distribution of its Epocast electrical insulating resins.

V V V

Elox Corp. has named Joseph Montgomery general sales manager of the company. He has been in the sales division of Elox for three years, and most recently in charge of foreign sales.

VVV

Paul J. Chaney has been appointed sales manager of A. B. Farquhar Div. of the Oliver Corp. Formerly sales manager of the Aviation Div., he now will manage sales of hydraulic and mechanical presses and special machinery.

VVV

Users of plastic materials in 11 western states will be served by Precision Tool Sales, 417 E. Florence Ave., Los Angeles, which was recently appointed western representative for Marblette Corp. The company, headed by Robert M. Snader and Lew W. Goodwin, both members of ASTE's Los Angeles chapter, now represent Marblette in Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington and Wyoming.

 $\vee$   $\vee$   $\vee$ 

Byron Confer has been appointed Indiana district sales manager for Ettco Tool Co. Mr. Confer, who is a registered professional engineer and member of ASTE's Indianapolis chapter, has specialized for the past two years in industrial sales activities in Indiana.

V V V

Manufacture and distribution of Inductosyn automatic control equipment will hereafter be carried on by Farrand Controls, Inc., 4401 Bronx Blvd., New York, N.Y. according to an announcement by The Farrand Optical Co., Inc.

#### corporate changes

Two filter lines, Honan-Crane and Michiana, have merged to form a new subsidiary of Commercial Filters Corp. The action follows the recent purchase by Commercial Filters of HoudailleHershey of Indiana, Inc. and the Filter Div. of Michiana Products Corp. The two filter lines will be retained under their present names while a new brand name, CFC, will identify filtering and conveying equipment formerly known as Houdaille. The newly formed subsidiary, called Indiana Commercial Filters Corp., will produce a complete line of filters under all three trade names.

The N. A. Strand Div. of Franklin Balmar Corp. has been purchased by the R. G. Haskins Co. The acquired firm will continue to serve its customers as a wholly owned, independently operated subsidiary. E. P. Grismer has been named general manager of the N. A. Strand Flexible Shaft, Inc. and also will continue as chairman of the board of Haskins.

VVV

Transfer of the net assets, name and goodwill of Mason-Neilan Regulator Co. to Worthington Corp. in exchange for Worthington common stock has been agreed to by both companies. The Mason-Neilan plant and facilities will



be operated as the Mason-Neilan Div. of Worthington, while the entire working force and management staff will be continued in their present positions.

Exclusive manufacturing and sales rights to an electronic weight and force indicating device developed for industrial uses and control of loads in air and surface transportation, have been purchased from Control Cells Corp. by Ball Brothers Co. Inc. The device will be made at Boulder, Colo., where Ball organized a Control Cells Div. with the entire personnel of the acquired firm as members of the new manufacturing group. E. S. Safford, president of Control Cells Corp, at the time Ball acquired the product, is general manager of the new division.

Acquisition of Kuma Tool Co. has been announced by Production Tool Corp. which will operate it as a division. Present management of Kuma Tool will continue. According to the purchasing firm, the addition will enable Production Tool to expand and diversify its production and further serve requirements of its customers.

All capital stock of the Arrow Shoe Machinery Co. has been bought by Landis Machine Co. and will be operated by Landis as a wholly-owned subsidiary. The acquired facilities will be primarily maintained for rebuilding used machinery traded for new equipment. Roy Sutton, former owner of Arrow Shoe, has been named vice-president in charge of sales for Landis.

#### anniversaries

Crucible Steel Co. of America is celebrating the fiftieth anniversary of the pouring of the first heat of electric melted steel in America. Use of electric arc melting furnace was introduced in 1906 by the Halcomb Steel Co., which soon afterward became part of Crucible Steel. The original furnace is now enshrined on the grounds of Crucible's Sanderson-Halcomb Works at Syracuse, N.Y. where the original work was done.



The Elwell-Parker Electric Co. is this year celebrating the 50th anniversary of industrial truck production. Although the company originally was founded in 1893, its first industrial truck was not produced until 1906. Before that, the firm was engaged in design and manufacture of electric motors and generators. The first truck, consisting of an ordinary hand-drawn baggage truck with batteries and motor beneath the deck, is now on exhibition at The Henry Ford Museum & Greenfield Village.

#### moves

Manufacturing machinery of the Frostrode Div. of Warren Alloy has just been transferred to expanded quarters at 421 Ferry St., Pontiac, Mich. The new plant gives the company larger manufacturing facilities, closer to both suppliers and their market while it also permits the housing of product design and development, engineering manufacturing and sales under one roof.



**Executive offices** of Link-Belt Co. have been moved to the Prudential Plaza, in Chicago, Ill.

Negotiations for leasing new quarters at 2202 Broadway, Santa Monica, Calif., have been completed by Ferro Cast Corp. The acquisition more than doubles manufacturing space which the company has been utilizing in the past five years.

#### v v ·

Plans have been made to move executive administration offices of Thor Power Tool Co. to the Prudential Building in Chicago. The transfer is scheduled for October or November of this year. All executive officers in the company's management and sales groups, and division managers in sales and sales promotion will be involved.



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Number	COMPANY	DESCRIPTION
A-5-162-1	Ace Drill Corp	Drill Blanks-Catalog No. 52-A contains information on Ace ground-from-
		the solid drills and hardened H. S. S. drill blanks. (Page 162)  Inspection—Illustrated booklet provides practical information on the use
A-5-324-1	American Pullmax Co., Inc	of the Borescope in various industries. (Page 230) Special Machines—Catalog contains information on multi-operation ma-
A-5-209	Armstrong-Blum Mfg. Co	chines used in metalworking. (Page 324) High-speed Band Sew—Operational data on No. 8 Marvel band saw. (Page 209)
A-5-250-1	Barkedala Valves	Air Valves Date on 250 not 4 way air valve in bulletin A-5. (Page 250)
A-5-200	Barnes Drill Co	Honing Tools—Honing tools and abrasives described in catalog 500A. (Page 200) Mounted Wheels—Illustrated booklet "Wheels of Progress" gives the latest
A-5-61		development in electronic formulation of grinding wheels. (Page 60-61)
A-5-305		Diamond Wheels—Form A-1208, an authoritative 40-page booklet on "Grinding Cemented Carbides." (Page 305)
A-5-51	The Carlton Machine Tool Co	Radial Drills—Descriptive bulletin on the Carlton preselector and program- mer in operation. (Page 50-51)
A-5-11	The Cincinnati Milling Machine Co	Hydrospinning—Data on hydrospinning in Bulletin M-1873-2. (Page 11)
A-5-44	The Cleveland Crane & Engineering Co.	Bending Press—Catalog No. 2010 gives construction and engineering de- tails. (Page 44)
A-5-268-2	Collins Microflat Co., Inc	Surface Plates—Bulletin describing Collins Microflat Black Granite surface
A-5-203-1	Arthur A. Crafts Co., Inc.	plates. (Page 268)Carbide Form Tools—"Complete Carbide Tooling for Automation" describes
A-0-200-1		Crafts contribution to the tooling field. (Page 203)
A-5-10	Crucible Steel Co. of America	High-Speed Steel—"Crucible Publication Catalog" contains helpful data on Rex and other special steels. (Page 10)
A-5-192		Gage Parts—Catalog No. 8 describes Davis gage components. (Page 192)
A-5-328-2	J. Arthur Deakin & Son	Die-Sinkers—Catalog D gives data on the Deakin line of British machines (Page 328)
A-5-206	H. E. Dickerman Mfg. Co	
A-5-284-3		
A-5-59	The Fellows Gear Shaper Co	Involute Gears—Booklet entitled "The Involute Curve and Involute Gear- ing" contains data on gear design and also describes Fellows specia
		machines for making gears. (Page 59)
A-5-274		Tool Steels—Technical Bulletin 20-010 and 20-011 contains data on Cromo
A-5-53	Frauenthal Div. The Kaydon Engineering Corp	van for feed rolls, guides and wear parts. (Page 274
		granders. (Page 52-53
A-5-298	George Gorton Machine Co	Milling Machines—Catalog 2585 describes No. 3-48 vertical mills. Catalo 2605-1655 describes the Gorton general line of machines. (Page 298
A-5-36	Greenlee Bros. & Co	Automatics—Catalog A-405 contains information on Greenlee automati
		bar machines. (Page 36
A-5-333	Hanna Engineering Works	Cylinders—Catalog 750A gives details on Hanna fluid power cylinders. (Page 333
A-5-5	Hardinge Bron, Inc	Steel Collets-Bulletin 8 contains information on Hardinge-Sjogren chuck
A-5-256	Haynes Stellite Co. A Division of Union Carbide	and collets. (Page 5
	and Carbon Corp	Alloy Tools-Efficient metal removal with Haynes Stellite tools. (Page 256
A-5-IFC	The Heald Machine Co	Tool Sharpener-Bulletin 2-4-2 contains information on Model 3 Heald too
A-5-220.	Ideal Industries, Inc	sharpener. (Page—Inside Front Cover. Live Centers—Booklet on Ideal's line of live centers. (Page 220
A-5-70	The Ingersoll Milling Machine Co	Grinders—Ingersoll cutter grinders described in manual 65F (Page 7
A-5-163	Jarvis Corp	
		(Page 16)

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-5-279	Kearney & Trecker Corp	Machine Tools—Data Sheet No. 1080 contains data on new 12-station aut mation transfer machine. Bulletin SMD-56, describes K & T designs special machine tools. (Page 2)
E5=230-1	Louis Levin & Son, Inc.	Coulets and Micro Drills—Bulletin Q lists complete line of drills. Cata  M lists collets, instrument lathers and accessories. (Page 2)
-5-58 -5-179	Kennametal Inc	Die Steel-Booklet B-100 gives data on die steels. (Page i Welders-Bulletin SE-1355 shows methods of reducing cycle time a
-5-222 -5-176 -5-230-3	Lincoln Park Industries, Inc Marvel Engineering Co Jas. H. Marthews & Co	Filters-Catalog contains filter data. (Page II Marking-Bulletin FGP-200 contains data on general-purpose marki
- 5-62 - 5-218	Metal Carbides Corp The Micro-Positioner Corp	Indexing Table—Bulletin TE-5 contains data on the Micro-Positioner au
-5-233	The National Acme Co	matic indexing table. (Page 2  Forming Tools—Bulletin DT-52 contains data on Vers-O-Tool Heads  end-forming turning and thread cutting.  (Page 2
-5-249	Niagara Machine & Tool Works	Shears—Illustrated bulletin 69 contains information on Niagara underdrassing abears. (Page 248-2
-5-328-4	Northwestern Tool & Eng. Co	Setup Components—Catalog No. 3 contains data on T-Nut and stud s step block and clamp sets, and punch press sets. (Page 3
-5-204	Ready Tool Co	Grinder Centers—New Red-E booklet available on precision, antifrict Red-E grinder centers.
-5-319	Rivett Lathe & Grinder Co., Inc.	Valves and Cylinders Ninety-page catalog of working drawings, specifications and handy aids for air and hydraulic circuits. (Page 3
-5-242-3 -5-177: /	Geo. Scherr Optical Tools, Inc Seitert & Sons, Inc	Jig Borer-Catalog 3089 contains data on Leitz optical jig borer. (Page 2
-5=160	The Sentry Co	Electric Furnaces Catalog R-47 contains data on Sentry quality con hardening with electric furnaces. (Page 1
-5-35	Simonds Abrasive Co	the use of Simonds Abrasive segments. (Fage
1-5-190	Standard Parts Co	parts. (Page 1
-5-288		Cutting Oil—Stuart's Cutting and Grinding Fluid Selector and Dilut- Graph Folder available upon request. (Page 2
1-5-324-4 1-5-327 1-5-178 1-5-330	P. A. Startevant Co	Die Sets 24-page catalog on Superior die sets and supplies Cutting Tools—New selective catalog on reamers available Special Machines—Bulletin 15-T contains specifications on U.S. Mu
1-5-244 1-5-320-2	Universal Engineering Co The Vaill Engineering Co	Forming Machine-Bulletin T-1 describes Vaill tube and forming mach
-5-296	The Van Keuren Co	
L-5-67 L-5-316 L-5-251	Vascoloy Ramet Corp. Vier Engineering Inc. Wales Strippit Corp.	Tooling Specialties 1956 catalog on Standard Vlier specialties. (Page 3 Special Machine—Bulletin No. 12 D contains pictures and examples
1-5-228	S. B. Whistler & Sons, Inc	Wales duplicator and Wales fabricator with performance data. (Page 2)  Dies—Illustrated catalogs show simplicity, economy and versatility
\-5-1 <b>85</b>	Whitman & Barnes	Whistier perforating dies.  Cutting Tools—Catalog 106 contains data on W & B drills, reamers carbide tools.  (Page 1

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# abstracts of

#### **Heat Dissipation in Plastic Bearings**

Heat developed in a journal bearing depends upon the coefficients of friction of the materials of shaft and bearing. In general, these coefficients are similar. making it possible to base a comparison of developed heat on a uniform value. according to CMF. Meysenburg writing in the February 1956 issue of Werkstatt und Betrieb.

Dissipation of heat depends on the thermal conductivity of the materials involved and heat remaining in a bearing will be the greater the lower the thermal conductivity. Plastic materials used in bearings have an extremely poor heat conductivity, about 0.3 as against lead with 30, steel with 45 and copper alloys with 100 units measured in the metric system (kcal/meter/hour/C). Since plastic bearings run hot, they require either low bearing speeds or considerable amounts of lubricants and coolant. This, however, is often unsatisfactory due to the fact that the plastic material warps when soaked.

The author reports on a new type of plastic bearing in which the plastic is sprayed on a metal base. In this way, it is possible to reduce the plastic material to a thin layer which is backed by a metal of good heat conductivity. A thin layer of plastic of 0.040 inch or less does not retain the heat developed in a bearing but readily permits dissipation. Another advantage of a thin plastic layer is the absence of warping.

#### Clutches

The same issue of Werkstatt und Betrieb mentioned previously contains three papers on recent developments in clutches for machine tools and other machinery. W. Rudisch reports on the use of induction clutches; W. Scheid on the application of hydraulically and pneumatically controlled laminar or multiple disk clutches; while B. Zingsheim's article deals with magnetic

Induction clutches have no metallic



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contacts between the driver and the driven shaft. Coupling of the shafts depends entirely on the flux of magnetic forces in the space between the two parts of the drive. The clutches are. therefore, not subjected to wear so it is unnecessary to readjust the coupling. Of course, it is possible to use induction coupling for engaging and disengaging gears and shafts.

The author describes the application of induction clutches to wire drawing machinery and gives detailed data on torque, ratio of transmission, electric resistance and load capacity. He indicates that the induced moment can always be adapted to the load, thus permitting a constant time for starting and stopping of the machines. The starting time can also be controlled independently of the load or centrifugal moment. Furthermore, the clutch can be used as a safety device since the amount of slippage can be adjusted easily. In case of an excess load the coupling would slip without friction.

Comparing various types of laminar clutches, W. Scheid indicates that electromagnetically controlled laminar couplings run hotter and require more space than hydraulically controlled laminar clutches. The latter are, therefore, particularly well adapted to requirements of the machine tool designer and user. It is also possible to increase the capacity of the hydraulic type by increasing the oil pressure; an increase in the voltage-and therefore in the capacity-is not possible in the case of the electromagnetic type.

The author further indicates that the laminar couplings with hydraulic control are used in headstocks of lathes. Used in feed drives of universal milling machines, it is possible to bring the table to a stop within about 0.0008 inch. Information is also given on oil pressure, oil supply, oil temperatures etc.

Pneumatically controlled laminar clutches are usually reserved for heavy metal-forming machines rather than for metal-cutting machine tools. Presses of various types are shown and discussed.

Electromagnetic couplings require less shifting time than magnetic couplings. This important feature is discussed in detail with diagrams of electric circuits and Wheatstone Bridges.

#### Isotopes in Tool Engineering

A special issue of the Swiss magazine Industrielle Organisation published in December 1955 is devoted to radioactivity and instrumentation in industry. In addition to articles dealing with physical fundamentals, atomic energy, X-ray equipment, atomic counters and medical factors, an article entitled "Practical Application of Radioactive Substances in Industry" by H. Staeger is of interest to tool engineers.

A special counter was designed by R. Berthold for measuring the quantity of gamma rays in chips from metal cutting processes. The instrument cannot be used for measuring beta rays. Tests of this type were made many years ago in the United States. It is interesting to note that considerable wear differences were found in two types of carbides, as indicated by atomic particles removed from the tool and deposited on the chip. The author notes that isotopes to be used should have a short half-time radioactivity to eliminate the necessity of protection of personnel from rays.

Tool 1 containing 3.5 percent TiC, 2.5 percent TaC, 7.2 percent Co and 86.8 percent WC showed rapid wear during the first three minutes, but wear at a constant rate thereafter. Tool 2 with 9.3 percent Co, 4.7 percent TiC, no TaC and 86.0 percent WC showed less wear and also, it was uniform from the beginning. According to a diagram, wear of the second tool was approximately 50 percent of the wear of Tool 1.

Other applications of isotopes in industry in Switzerland concern destruction-free testing of materials, determination of cavities and pipe in castings, measuring of metal corrosion, testing of wall thickness and thickness of deposits. In order to determine the shifting of turbine wheels on shafts at the instant of starting the machine, isotope Co 60 was attached, as wire, to the periphery of the wheels and measured in a counter. This way, axial motions as small as 0.008 inch were detected.

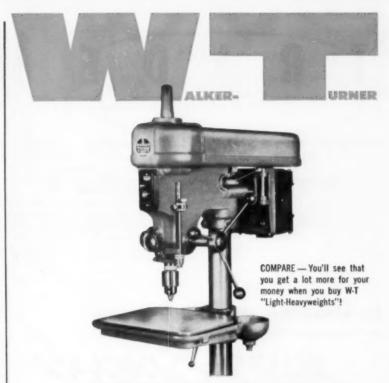
#### **Drilling Research**

Statistical investigations and research of drilling operations carried out by W. Leyensetter are reported in an article in the January 1956 issue of Werkstatt und Betrieb. He compares actual workshop conditions with standardized data for speed, feed, cutting speeds, tool angles, etc. as used in German industry.

American data are also included in the comparison, such as cutting speeds used in the drilling of aluminum, brass, cast iron and steel. In some cases, the American values are higher than the European data, in other cases the reverse trend can be observed.

It seems that cast iron is cut at higher speeds here than abroad, while with steel the reverse is true. The differences, however, are not substantial. The author himself notes that the lack of steel specifications made it difficult to draw conclusions, except in cast iron where American speeds are 45 percent higher.

The article covers many details such as comparison of tool angles, frequency of the angles, frequency of materials cut, type of operation, and drill diameter.

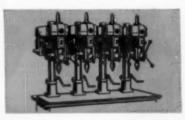


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Walker-Turner "LIGHT-HEAVYWEIGHT" Drill Press with 4" spindle travel — 1200 series — also available.)

Ask your Walker-Turner Distributor to demonstrate the big capacity of this 15" W-T Drill Press. He's listed under "Tools" in your phone book's Yellow Pages. Or write for his name and full specifications on these machines.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES



#### WALKER-TURNER

Division

Kearney And Trecker Corporation . Plainfield, N. J.

# **E** literature

For Free Booklets and Catalogs - Convenient Request Card on Page 201

#### Buffing, Grinding

Pocket-size disk chart useful for determining surface speed of buffing and grinding wheels; user can easily find surface speed, in feet per minute of any wheel from 1 to 60 in. in diam, turning at spindle speeds of from 220 to 20,000 rpm. Request directly from John S. Karinja, Hanson-Van Winkle-Munning Co., Church St., Matawan,

#### Slip Roll Formers

Revised Bulletin 77 describes new line of slip roll forming machines equipped for rapid forming of obround and rectangular shapes; includes explanation of factors governing selection and operation of slip roll formers, and description of standard line of equipment for cylindrical work. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11. N. Y.

#### Collets

Four-page Bulletin No. 56 offered as collet selection guide for all lathes, millers, grinders and fixtures; includes specification and dimension charts, conversion and interchangeability listings. plus information on collets for nose type collet chucks. Hardinge Brothers, Inc., Elmira, N. Y.

#### **Tooling Resins**

Chart lists physical properties of company's tooling resins including casting and laminating materials; includes basic information required in selection of epoxy resins for tooling, casting, laminating and gel coating purposes. Furane Plastics Inc., 4516 Brazil St., Los Angeles, Calif. L-5-3

#### **Precision Casting**

Twenty-page Bulletin GC-2 on Glascast precision casting process explains in simplified form how Glascast powder is made into shock-resistant, precision casting mold for high melting point alloys; includes production schedules for pilot run quantities plus detailed explanations on mixing plasters for the molds and mixing powder for slips; illustrated. Refractory Products Sales Dept., Corning Glass Works, Corning,

#### **V-Belt Drives**

Origin, history and development of modern multiple V-belt drive discussed in 36-page pocket-size Booklet 20E-8297; covers evolution of standards, explains how to engineer a V-belt drive. provides tables and data, and describes modifications; also serves to provide answers to questions relating to basic principles and practices involving engineering and use of multiple V-belt drives. Allis-Chalmers Mfg. Co., 1004 S. 70th St., Milwaukee, Wis. L-5-5

#### **Portable Power Tools**

Company's 1956 catalog presents line of industrial portable power tools well illustrated with photos as well as drawings to show details of construction, also discusses in detail the application and performance of various equipment. Skil Corp., 5033 Elston Ave., Chicago



Since 1913—through two wars and during the peace years—Eclipse has met the exacting and changing demands of industry for special purpose end cutting tools. What better test? What better recommendation? Our large modern plant can serve you, too. Send your problem to us, today!



#### **Tool Steels**

Tool Steel brand chart showing more than 300 tool steel varieties tabulates comparable metals from various fabricators. Vulcan Crucible Steel Div., H. K. Porter Co., Inc., 300 Park Ave., New York 22. N. Y. L-5-7

#### Perforating

Twenty-page booklet, "55 Perforating Problems and Their Solutions" includes most types of perforating problems, involving all types of metal and thicknesses; describes problem involved, solution, and gives actual production facts and costs. Pivot Punch and Die Corp., Punch Div., North Tonawanda, N. Y.

L-5-8

#### Lathe Fixture

Extensively illustrated 4-page folder LF56 describes in detail the company's universal adjustable precision lathe fixture; includes typical applications on parts normally difficult to hold; lists specifications and prices. Universal Vise and Tool Co., Parma, Mich. L-5-9

#### Cemented Carbides

"Characteristics of Kennametal" presents information on the company, material and its uses well illustrated by photos, drawings and diagrams. Data includes breakdowns of mechanical and physical properties of the metal, suggestions for design applications, outline of various grades, and a discussion of the characteristics of Kentanium, and a Kennametal Inc., Latrobe, Pa. L-5-10

#### Taps

Complete data on company's entire line of taps; also includes comprehensive tables and information on standard system for tap marking, major and pitch diameter tolerances, and other pertinent data. The Wood & Spencer Co., 1930 E. 61st St., Cleveland 3, Ohio.

L-5-11

#### Control, Transfer Switches

Twenty-eight page Bulletin GEA-4746B covers line of control and transfer switches for low voltage applications up to 600 volts AC or DC; includes photos, drawings, cutaways and discussions of special features; also contains application data with representative contact diagrams. General Electric Co., Schenectady 5, N. Y.

L-5-12

#### Alloy Steel

Charts, graphs, sketches and photos illustrate booklet describing T-1 high-strength, readily welded, alloy steel; also gives details on properties, characteristics and other features. Lukens Steel Co., Coatesville, Pa. L-5-13

NEW OAKITE CLEANERS
GIVE YOU MORE FOR YOUR
PAINT-PREPARATION DOLLAR

# Here are 4 ways to end pre-paint metal-cleaning troubles

Does your trouble chart show that you need better cleaners, strippers or surface conditioners?

Cleaning solution foams excessively in spray washing machine. See 1 below.

Streaky discolorations or powdery residues cling to surface of steel parts being stripped for repainting. See 2.

Zinc phosphating process too difficult to control... Iron phosphating process doesn't show good results in salt spray tests. See 3.

Too many operations—cleaning, pickling, neutralizing, etc.—are needed to prepare steel that does not require phosphating before painting. See 4.

Here are brief descriptions of new Oakite materials designed to end these particular troubles:

- 1 For a spray washing solution that does not foam at high pressure, try Oakite Composition No. 161. Does not attack aluminum.
- 2 For stripping pigmented paint, phosphate coatings and undercoat rust in one operation, try Oakite Rustripper.
- 3 For a zinc phosphating process that is truly easy to control, try new Oakite CrysCoat SW... For salt spray results far beyond the capacity of ordinary phosphating processes, try new Oakite CrysCoat No. 89.
- 4 For one-operation removal of rust, heat scale, welding residues and light soil together with good preparation for painting, try Oakite Compound No. 131. Inhibited against attack on steel.

FREE Check the coupon and we will send you free booklets or bulletins with full information on new Oakite cleaners.



OAKITE PRODUCTS, INC. 58 Rector Street, New York 6, N. Y.

Send me free booklets or bulletins giving complete information on the new Oakite materials checked below:

- Oakite Composition No. 161
- ☐ Oakite CrysCoat SW ☐ Oakite CrysCoat No. 89
- Oakite Rustripper Oakite Compound No. 131

NAME\_\_\_\_

COMPANY

ADDRES!

#### Surface Measurement

Illustrated 8-page technical bulletin contains essence of ASA Standard B46. 1-1955 on surface roughness, waviness and lay as well as supplementary material arranged for easy reading and convenient reference; includes basic definitions, how to designate characteristics of roughness, waviness and lay on drawings, types of roughness-height average, with arithmetical and rms average explained, plus other data. Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich.

L-5-14

#### **Turbine Pump Motors**

Bulletin #1903, illustrated by photos and technical drawings showing features and applications of various types of vertical turbine pump motors, describes company's hollow shaft Verticlosed grease and oil lubricated motors in sizes from 1½ to 400 hp as well as single phase designs up to 7½ hp and totally enclosed types up to 150 hp; also includes other data of interest to engineer in this field. U. S. Electrical Motors Inc., Box 2058, Los Angeles 54, Calif.

L-5-15

#### Roller Bearings

Greater load capacity, simplified application and other features of company's self-aligning roller bearings described in detail in 8-page booklet No. 2658; also gives engineering selection information, complete dimensional specifications and recommended fitting practices. Link-Belt Co., Dept. PR., Prudential Plaza, Chicago, Ill.

L-5-16

#### Aluminum

Twenty-four page brochure offers information on company's mill products and services; includes data on aluminum alloys, forms, mechanical and physical properties, applications, fabricating and finishing techniques and availability. Kaiser Aluminum's Industrial Service Div.-PR 256, 1924 Broadway, Oakland 12, Calif. L-5-17

#### **Precision Tooling**

Facilities, equipment and experience for work on precision check-gages, dies, jigs and fixtures presented in extensively illustrated 24-page brochure. Ehr hardt Tool and Machine Co., 914 Monroe St., St. Louis 6, Mo. L-5-18

#### Copper Dies

Informative 4-page folder on beryllium copper dies covers uses and advantages of subject; includes details on plastic molds and dies, forging dies, steel forming and draw dies, itanium forming and draw dies, and zinc die casting dies. The Beryllium Corp., Reading, Pa.

L-5-19

#### Chucks

cold rolled steel

up to 3/16" thick

and up to 2 lbs

per linear foot weight

Catalog No. E-200, designed to simplify specifying and buying of Horton chucks, features visual reference index for quick location of the type of chuck desired for specific job; illustrated catalog is sectionalized to centralize each type of chuck with corresponding jaws and parts; includes illustrations and dimensional drawings. E. Horton & Son Co., Div. of the E. Horton & Son Co., Windsor Locks, Conn.

L-5-20

#### Fluxing for Silver Brazing

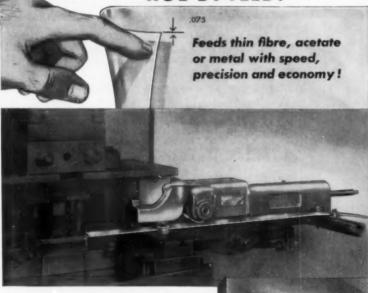
Pocket-size manual, "A Complete Guide to Selective Fluxing for Low Temperature Silver Brazing," serves as reference for proper fluxing practice; selector chart permits choice of flux based on specific temperature ranges and metals to be joined. Booklet also outlines applications and characteristics of company's fluxes. Second pocketsize booklet, "A Complete Guide To Successful Silver Brazing," also available. The American Platinum Works, 231 W. Jersey Railroad Ave., Newark 5, N. J.

L-5-21

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# technicas horts

A NEW NITRIDING PROCESS of stainless steel has been developed for use on parts where an extra hard, wear resistant surface with maximum corrosion resistance is required. With this tech-

nique, called Supercasing, depths are controlled to very close limits. Only a light case is necessary, bow-

New Technique For Nitriding Stainless Steel

ever, because of the case's degree of hardness. Normal case depth using the new process, ranges between 0.0003 to 0.0007 in. although tests so far show that small gears nitrided in this manner have outlasted the life of the unit in which they were to be used.

In the event of a change after parts have been finished, the Supercase may be removed and the parts reworked and then renitrided. Should certain areas of a part be destined for further machining after nitriding, such an area can be masked off and will remain softer after processing.

The process may be applied to martensitic, ferritic as well as austenitic stainless steel.

REQUIRED ROCKWELL C hardness for a specific piece may now be applied merely by spraying on the proper powder. The new hard-facing substances, developed by Western Carbide Corp.,

subsidiary of Superweld Corp., are nickel base alloy powders that can be sprayed from various type guns

Powder Metal Spray For Hardfacing

on metals with melting points above 1850 F. These powders, designated Hi-C spray powders, provide a homogeneous deposit which is highly resistant to wear, corrosion and oxidation at high temperatures. Identification as to Rockwell C scale hardness is indicated by the number following the Hi-C designation; a Hi-C 60 spray powder has a minimum Rockwell C scale hardness of 60. Hardnesses of 40, 50 and 60 are available.

Among the advantages claimed for the innovation are longer life for parts such as cams, pump parts, push rods, etc.; low coefficient of friction, uniform deposit with unusually hard chromium boride particles in a hard, corrosionresistant matrix. More than 80 percent of hardness is reported to be retained at 1000 F and approximately 70 percent at 1400 F. The surface is resistant to oxidation for long periods of time at temperatures as high as 1800 F. Fused surfaces sprayed with Hi-C powders may be hot-forged, and the sprayed and fused surface can be ground to a fine surface finish. Broad fundamentals of the foundry art are presented in a color film recently produced by Mechanite Metal Corp. Primarily, the movie is aimed at fur-

Film Presents Foundry Rules nishing the design engineer with a series of basic design rules of foundry practice

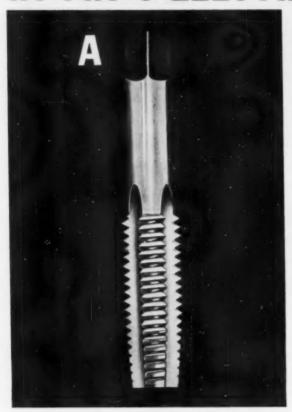
in order that he may take into consideration the advantages and economies to be gained from the use of cast to form metals. The film, which consists of 52 frames on a 35 mm filmstrip with a 12 in. 33% rpm long playing record, requires 35 minutes running time.

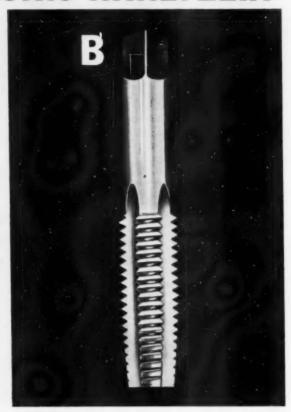
It is available either for purchase or on loan from the company, 714 North Ave., New Rochelle, N.Y.



ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

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#### The serious defect in Tap B is invisible. But Hy-Pro's Electronic Analyzer detects all structural flaws for your protection.

HY-PRO's amazing new Electronic Analyzer is one of the three important steps which Hy-Pro takes to insure you of 3-way Quality Control. These three steps are the Electronic Analyzer, advanced Heat Treating and the Micro-Hardness Tester.

Here's how the Electronic Analyzer works. A standard tap, perfect in every detail, is put in one side of the machine. The tap to be tested is put in the other side. Electronic impulses are shot through both taps and every inch of each tap is tested

as to composition, surface condition and internal structure.

The Hy-Pro Electronic Analyzer reveals every defect, including those that laboratory, production tapping and destructive tests fail to uncover!

The best part of the Hy-Pro story is that you get the benefit of these new Hy-Pro developments at no extra cost to you. Get in touch with your nearest Hy-Pro distributor or call us direct. Hy-Pro qualitycontrolled taps-products of the Tap Specialists-cost no more than ordinary taps.





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Several changes in the organization of The Fellows Gear Shaper Co. were recently announced. Edward W. Miller, formerly president and general manager, was elected president of the company. At the same time, Edwin R. Fellows, II, who was assistant general manager and export manager, was named vice-president and general manager.

Howard U. Herrick, who has been president of E. W. Bliss Co., was recently elected to the newly created office of chairman of the board. He will now serve as chief policy officer of the company.

At the same time, the company announced that J. H. Tredinnick, who resigned as an executive vice-president, director and member of the executive committee, will remain as a vice-president and as a consultant to the company's new president, Robert Potter.

Joseph L. Knopf was elected vicepresident of Morey Machinery Co., Inc., by the company's board of directors. A veteran of '33 years with the company, he has served in many capacities including assistant factory manager, production manager, and has been a director for the past year. Herbert I. Segal, a director of Van Norman Industries, Inc., was recently elected president of the company. Associated with the machinery business or related fields since 1914, Mr. Segal also is president of Segal Affiliates, Inc., chairman and director of Hasco Machinery Co., and vice-president and director of Curtice-Lyle Properties, Inc. and of Rochester Industrial Terminal, Inc.

Dahlstrom Machine Works, Inc., has made Bruce Ballman, former sales manager, executive vice-president and general manager. At the same time, the company named Harry E. Stanfield vice-president and assistant general manager. Mr. Stanfield was works engineer.

At the annual meeting of the American Welding Society, John J. Chyle, director of welding research at A. O. Smith Corp., was elected president for the 1956-57 year. Other officers elected included Clarence P. Sander of Consolidated Western Steel Div. of United States Steel Co. who is now first vice-president of AWS, and Gustav O. Hoglund of Alcoa Process Development Laboratory Aluminum Co. of America, who was made second vice-president.

Election of two new vice-presidents of Formsprag Co. has been made public. Charles F. Trapp, Jr., who has been sales manager since August, 1955, was made vice-president in charge of sales. L. T. Szady, formerly chief engineer for Formsprag, is now vice-president in charge of engineering.

Election of Stephen L. Ingersoll as president and general manager, succeeding H. G. Ingersoll, who retired, has been made public by Ingersoll Steel Div. of Borg-Warner Corp. The new president, who has served the division since 1920, has been its executive vice-president since June, 1954.

Vincent L. Bradford, vice-president in charge of sales for the Milford Rivet & Machine Co., has been made executive vice-president of the company.

Announcement was recently made of the appointment of Ray W. Heiden to the post of director of manufacturing in charge of the company's entire manufacturing operation, and of Ronald L. Loup as director of engineering for all the company's divisions. Both men have been associated with Progressive for a number of years.

Eugene C. Clarke, Jr. is new president of Chambersburg Engineering Co., succeeding his father who retired. He previously was general manager of the firm.



John P. Roche was elected president of Heppenstall Co., succeeding R. B. Heppenstall, who became board chairman. Mr. Roche was executive vice-president.



Roland Lehr has been made president and general manager of Baker Brothers, Inc. Prior to joining Baker, he was sales manager of the Quincy Compressor Co.



Robert Potter has been elected to the office of president and chief administrative officer of E. W. Bliss Co. He formerly was an executive vice-president.



Two manufacturing executives recently appointed at Goddard & Goddard Co. include James F. O'Donnell and Harold Thom. Mr. O'Donnell, who is now production manager, spent a number of years in his own industrial engineering firm before making his present association. Mr. Thom, who has been with Goddard & Goddard for 31 years, is now factory superintendent. He was in charge of the milling cutter department.

Appointment of F. B. Tannehill as chief industrial engineer has been revealed by Axelson Mfg. Co., Div. of U. S. Industries. He formerly was with Automatic Electric Co. where he was supervisor of methods engineering.

Herbert O. Patchel, Jr., has been named vice-president and assistant to the president of The Babb Co., Inc. Mr. Patchel, who formerly was associated with Rheem Mfg. Co. as works manager, is a member of ASTE's Keystone chapter.

O. Jules Poupitch has been named to head a new development program for Illinois Tool Works. As product development consultant both for the company's Fastex and Shakeproof Division. Mr. Poupitch, who has been a member of the company's research and product development Div. will be available for consultation, while being primarily responsible for fostering development of special purpose metal and plastic fastening items.

Two new appointments recently were announced by Skinner Chuck Co. and Skinner Electric Valve Div. George Goepfrich, formerly chief engineer of the Electric Valve Div., is now director of engineering and development. Succeeding him at the post of chief engineer, is Robert B. Clay who previously was assistant chief engineer of the division.

Appointment of Harley Erickson as production manager was announced by Eutectic Welding Alloys Corp. Mr. Erickson was formerly general foreman of production for Lincoln Electric Co. and Westinghouse Electric Corp.

Leo G. Jacques has been made a vice-president of Allied Products Corp. and will serve as general manager of the corporation's Richard Brothers large die, foundry and pressed metal divisions. He has more than 34 years' experience in the field, two years of which he was president of Motor Products Corp.

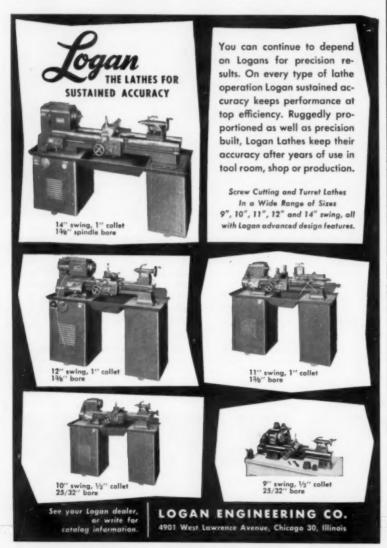
John P. Bunce, staff assistant to the vice-president in charge of manufacturing at Kearney & Trecker Corp. has been made assistant works manager for manufacturing operations at the firm's standard machine division plant.

William I. Matthes has been elected to the recently created post of executive vice-president at Arwood Precision Casting Corp. For the past 11 years, he has been associated with Arwood as secretary, vice-president in charge of sales and vice-president in charge of operations.

Andrew B. Pulliam was appointed director of manufacturing services for Borg-Warner Corp. He has served as chief industrial engineer for the New York Central System for the past two years.

Announcement was made of Jesse L. Powers' appointment as general manufacturing manager of Buick Motor Div. Mr. Powers, who has more than 40 years experience with Buick, has been assistant general manufacturing manager for the past five years. He succeeds Edward T. Ragsdale who was promoted earlier to the post of general manager of Buick.

Gilbert S. Wright was made chief engineer of the press and special machinery department of the A. B. Farquahar Div. of Oliver Corp. He will supervise and coordinate engineering for hydraulic and mechanical presses and special machinery.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-212

# who's meeting

where

May 3-9. American Foundrymen's Society. 60th annual Foundry Congress and exhibit. Convention Hall, Atlantic City, N. J. For further facts, contact society headquarters, Golf and Wolf Rds., Des Plaines, Ill.

May 4. The Ohio State University, College of Engineering. Annual conference for engineers. Get further information from Assoc. Dean Harold A. Bolz, College of Engineering, The Ohio State University, Columbus 10, Ohio.

May 9-11. AMERICAN WELDING SOCIE-TY. National spring meeting, and fourth Welding and Allied Industry Exposition, Buffalo, N. Y. Definite data is available from society headquarters, 33 W. 39th St., New York 18, N. Y.

May 14-17. Design Engineering Show. First of annual shows to be devoted to original equipment which goes into manufacture of finished products. Convention Hall, Philadelphia, Pa. Contact exposition managers, Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

May 15-16. ARMOUR RESEARCH FOUNDATION of Illinois Institute of Technology. Industrial Nuclear Technology Conference, Museum of Science and Industry, Chicago, Ill. General information is available from the Foundation, Attn.: Joseph J. Kowal, conference secretary, 10 W. 35th St., Chicago 16, Ill.

May 16-18. Society for Experimental Stress Analysis. Spring meeting, William Penn Hotel, Pittsburgh, Pa. Contact society office, P.O. Box 168, Cambridge 39, Mass. for details.

May 17-18. AMERICAN INSTITUTE OF INDUSTRIAL ENGINEERS. Seventh annual conference on fundamentals, current practice and recent advances. Shoreham Hotel, Washington, D. C. Further facts may be had from institute office, 145 N. High St., Columbus 15, Ohio.

May 23-24. AMERICAN IRON & STEEL INSTITUTE. Annual meeting, Waldorf-Astoria, New York, N. Y. More information is available from institute office, 350 Fifth Ave., New York 1, N. Y.

May 23-26. NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS. Annual meeting, Ambassador Hotel, Atlantic City, N. J. Get further data from society headquarters, 2029 K St., N. W., Washington 6, D. C.

May 24-25. Purdue University, School of Mechanical Engineering. Conference on mechanisms, to be held at the university, West Lafayette, Ind. Get more information from the School of Mechanical Engineering.

May 28-30. NATIONAL FLUID POWER ASSOCIATION. Annual spring meeting. The Greenbrier, White Sulphur Springs, W. Va. For other information, write association headquarters, 1618 Orrington Ave., Evanston, Ill.

June 3-8. Society of Automotive Engineers, Inc. Summer meeting. Chalfonte-Haddon Hall, Atlantic City, N. J. More facts are available from society office, 29 W. 39th St., New York, N. Y.

June 5-8. THE MATERIAL HANDLING INSTITUTE'S Exposition of 1956. Technical sessions and exposition, solely for material handling equipment. Cleveland Auditorium, Cleveland, Ohio. Further facts may be secured from institute office, Suite 759, One Gateway Center, Pittsburgh 22, Pa.



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a Infinitely Variable Feed Stroke from 0" to 41/2"

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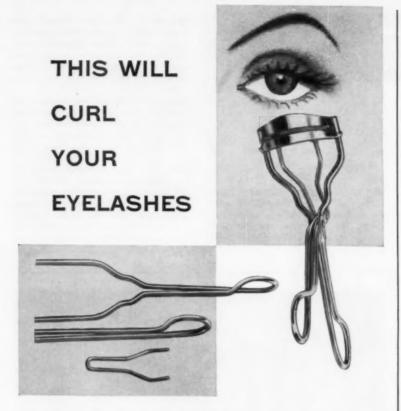
Choose from two basic types, in a variety of

sizes and drives. Mount them in horizontal,

vertical or angular positions . . . MORRIS

Drill Units permit complete automatic control

for precise drilling, reaming, tapping, spot-



A Nilson #2 Four-Slide Automatic Wire Forming Machine is being used by Rollash Corporation, Brooklyn, N. Y., to form wire as shown for their eyelash curler...complete in one operation. After one year's operation they report savings of—

40% on actual manufacturing costs

15% on improved tooling which eliminates secondary operations, 10% on fewer rejects, full parts control assuring top precision. . . . elimination of freight charges by making parts on premises, advantage of immediate access to production.

TOTAL SAVINGS . . . OVER 65%

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- · One-man operation
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- · Fast tool and die changing
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- · Press sections 5 to 30 ton cap.
- · Heavy duty models 50-75 ton cap.

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June 6-17. Washington University. Intensive course on motion and time study, offered by university's Dept. of Industrial Engineering with cooperation of St. Louis Chapters of American Institute of Industrial Engineers and Society for Advancement of Management. Write Dept. Industrial Engineering, Washington University, St. Louis 5, Mo. for full information.

June 11-23. State University of Iowa, College of Engineering. 17th Annual Management Course covering production planning, job evaluation, motion and time study, plant layout, materials handling, quality control, supervisory training and other management phases. Details are available from J. Wayne Deegan, 122 Engineering Bldg., State University of Iowa, Iowa City, Iowa.

June 11-15. THE SOCIETY OF THE PLASTICS INDUSTRY, INC. 7th National Plastics Exposition, New Coliseum, New York, N. Y. Request further facts from society headquarters, 67 W. 44th St., New York 36, N. Y.

June 12-15. CORNELL UNIVERSITY, Department of Industrial and Engineering Administration, Sibley School of Mechanical Engineering. Annual industrial engineering seminars covering industrial management, manufacturing engineering, small plant management, methods engineering, applied industrial statistics and industrial marketing. Get all facts from Andrew Schultz, Jr., Department of Industrial and Engineering Administration, Cornell University, Ithaca, N. Y.

June 17-21. AMERICAN ELECTROPLATERS SOCIETY. 43rd annual convention. Hotel Statler, Washington, D. C. Full information may be had from society office, 445 Broad St., Newark 2, N. J.

June 17-22. AMERICAN SOCIETY FOR TESTING MATERIALS. 59th annual meeting and 12th apparatus exhibit. Chalfonte-Haddon Hall, Atlantic City, N. J. Write for particulars to society office, 1916 Race St., Philadelphia 3, Pa.

June 17-22. THE PENNSYLVANIA STATE UNIVERSITY. Creative engineering seminar. Write for further information to the university's General Extension Information, University Park, Pa.

June 18-29. Massachusetts Institute of Technology. Special summer program on "Wear Theory in Metal Cutting and Bearing Design" offered by the Metals Processing Div. of the Institute. Full details and application blanks may be had from Summer Session Office, Room 7-103, Massachusetts Institute of Technology, Cambridge, Mass.

Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".



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Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.



#### Toolmakers' Microscope

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.



#### Micrometer Slide Comparator

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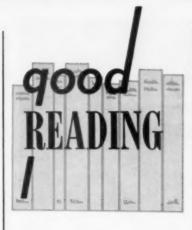
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Write for Bulletin 161-54 showing applications, models, specifications.

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INDICATE A-5-215-1



HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION—by Harry L. Stewart, assisted by Floyd D. Jeffreys. Published by The Industrial Press, 93 Worth Street, New York 13, N. Y. Price \$8.50.

A comprehensive, well-illustrated reference book for designers, buyers, installers and operators of hydraulic and pneumatic equipment for production machinery. The term "Fluid power" has been employed in this book to mean the use of fluid, both liquid and gaseous, for the transmission of power in the manufacturing industry, in contrast to the use of electricity or purely mechanical means, for machine operation and control. Thus, anyone acquainted with manufacturing operations, particularly in the metalworking field, is aware that fluid power is now widely used for machines for such purposes as holding, moving, exerting constant or varying pressures, synchronizing, sequencing, etc.

The book is divided in 20 different sections, each dealing with one phase of fluid power.

The book contains facts needed to guide the individual in obtaining the right hydraulic or pneumatic equipment for the job at hand and to help maintain it at top operating efficiency.

ELECTRO-TECHNOLOGY, By M. G. Say. Published by Philosophical Library Inc., 15 E. 40th St., New York 16, N. Y. Price \$6.00. 167 pages.

Basic theory and circuit calculations for electrical engineers are presented in concentrated form in this book. Introductory material on conduction and magnetic and electric field effects is given. Data on the handling of circuit problems for two-terminal and four-terminal cases, and for balanced and unbalanced three-phase cases are covered. Most of the primary circuit problems for both steady and transient states are included. The book also contains a collection of network theorems and adequate definitions.

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METALS HANDBOOK 1955 SUPPLEMENT, Prepared under the direction of the Metals Handbook Committee, American Society for Metals. Published by American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. Price \$6.00, 208 pages.

Comprehensive surveys of 21 subjects are contained in this book, which was prepared by 179 experts in the field of metals. A metals and applications section covers selection of sheet steel, material for press forming dies, and selection of gray cast iron, stainless steel in chemical process industries and aluminum alloy castings. The design and application section includes material on closed die forgings, helical steel springs, surface finish, residual stress and the selection of electroplated coatings. Articles on processing and fabrication encompass induction hardening and tempering, flame hardening, gas carburizing, forging and heat treating of tool steel, metal cleaning costs and others. A testing and inspection section covers creep and creep rupture tests, radiography of metals and macro-etching of iron and steel.

ATOMIC ENERGY RESEARCH AT HARWELL, By K. E. B. Jay. Published by Philosophical Library Inc., 15 E. 40th St., New York 16, N. Y. Price \$4.75 144 pages.

This book carries forward the story of the Atomic Energy Research Establishment from the point at which it was left in the report of 1952 (Harwellthe British Atomic Energy Research Establishment, 1946-1951) up to the formation of the United Kingdom Atomic Energy Authority in August, 1954. The author has been Principal Scientific Officer at Harwell since 1947. Advances in production, reactor, isotope and other programs are described in the first part of the book. The second part of the book deals with fundamental research in the fields of physics, chemistry and chemical engineering, and metallurgy.

PROFESSIONAL ENGINEER'S EXAMINA-TION QUESTIONS AND ANSWERS, By William S. La Londe, Jr. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price \$6.50, 462 pages.

Over 500 questions drawn from recent actual examinations for Professional Engineer Licenses, Land Surveyor Licenses and Engineer-in-Training Certificates form the content of this book. Fundamental engineering, and chemical, civil, electrical and mechanical engineering questions are covered. Detailed answers are given. Engineering Drawing and Geometry, By Randolph P. Hoelscher and Clifford H. Springer. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price \$8.00. 526 pages.

Understanding of principles, rather than the development of manual skills, is emphasized in this profusely illustrated textbook, prepared for freshman and sophomore engineering students. The organization and methods of a previous book by Randolph P. Hoelscher and Harvey H. Jordan have been followed. The present book has been almost entirely rewritten.

The subjects covered include geometrical constructions; various types of projections; sectional views and dimensioning; perspective; charts and diagrams; map drawing, architectural and structural drawing; pipe, machine, tool and welding drawing; reproduction of drawings; and patent drawings.

MECHANISM, By Joseph Stiles Beggs. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price \$6.50. 418 pages.

Intended as a textbook for a course in advanced kinematics, this book also provides the practicing design engineer with a reference book for the analysis of mechanisms and a source of mechanical movements. Selection of mechanisms and the design of members, and their interdependence are discussed, as are methods for determining the position, velocity and acceleration of various parts of a mechanism. Material on gears, cams, rotary drives, linkages, tension and flexural links, fluid compression links, computing mechanisms and controls is also presented. A chapter on Newtonian mechanics of rigid bodies is included. The concluding chapter contains illustrations of mechanical movements arranged alphabetically by the type of motion they produce.

WRITING USEFUL REPORTS, By Robert E. Tuttle and C. A. Brown. Published by Appleton-Century-Crofts, Inc., 35 W. 32nd St., New York 1, N. Y. Price \$4.50. 635 pages.

Primarily intended for those who prepare reports of a non-routine nature, this book discusses what to use in building a report, how to organize a report and present the facts, techniques of writing and checking, illustrations, and format. Approximately half of the book is filled with sample reports, which are fully analyzed to enable the report writer to develop flexibility in applying the principles and methods outlined in the book.



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Write for Bulletin TE-5.



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#### Engineering for Progress in Manufacturing



By D. J. Davis

Vice President — Manufacturing Ford Motor Co., Dearborn, Mich.

L OOKING AT CURRENT TRENDS in manufacturing from a broad viewpoint, it is evident that this country's position as a world power today is due not alone to natural resources, but in major part to technological progress. This progress has been made possible only through a free enterprise system spurred by vigorous competition.

With frequent product changes bringing added pressure on manufacturing groups, sound manufacturing planning must be given full consideration, with particular emphasis on research and development. Forward product planning has come into its own in the last ten years, especially in the automotive industry. Product planning people in industry work with styling and product engineering groups to develop a package for each new product or model. These new products are designed to meet customer preference as revealed by market surveys and analyses.

During the designing period, close coordination is maintained by styling and product personnel with manufacturing engineering, through the medium of liaison committees. This assures manufacturing feasibility of advanced designs before detailed engineering has progressed too far. As a result, firm product design decisions are made after manufacturing and material handling techniques have been thoroughly considered—long before final detailed engineering has been completed and releases issued. This kind of teamwork between product and manufacturing engineering saves much time and effort.

#### Manufacturing Planning

Flexible manufacturing planning has become a major factor in today's modern concept of production. How complete, how sound and how effective the planning is depends on a variety of factors:

- Specific product engineering information must be as firm as possible.
- Capacity requirements and planning volumes must be firmly established.
- Decisions whether to make or buy specific parts or assemblies must be made soon enough to permit tooling in time for introduction dates.

Only after these points have been established is it possible to proceed on a firm basis. The first step in detailed planning is to determine, from experience and judgment, sequence of operations

to be performed to make each particular part. Machines required are tentatively determined at this time and selected, based on type of operations necessary and volumes required.

In general, it may be said that the trend is definitely toward this modern concept of manufacturing, which requires consideration of each part, operation, machine, tool and work place.

#### Automation

Perhaps the most publicized trend in manufacturing today is the development of automation. This is a logical evolutionary result of the continuous trend toward improving manufacturing methods and quality. Its meaning today goes far beyond the limited definition of a few years ago, namely, automatic handling. Automation represents an entirely new philosophy of manufacturing and embraces all operations—making, inspecting, assembling, testing, handling and packaging.

The decision to automate production of any specific part is made only after long deliberation and careful consideration of all factors involved, particularly the economic ones. Like every other important technological development from the steam engine to atomic power, automation has created many new jobs—far more than it has displaced. It

Conference of manufacturing engineers fits together plant requirements, make-or-buy decisions, equipment and tooling in planning of production.



Plant layout engineers route the flow of materials through production lines of new plant.





INDICATE A-5-220



Model shop in manufacturing engineering produces assemblies to scale for study of production problems involved in advanced product designs.

has made a number of old jobs more interesting and less arduous, created many new products and services. It has allowed industry to produce more goods for a wider market at a lower cost and with less human effort.

#### Standardization

While much progress has been made in establishing manufacturing standards in general, much remains to be done to expedite the recent trend in manufacturing toward standardizing major components of highly specialized machine tools.

As industrial productivity has increased, facilities investment has grown and increasing complexity of machinery has placed greater emphasis on maintenance, and the problem of obsolescence associated with accelerated changes in product design. To overcome these problems, components of automatic inline machines might be standardized on an industry-wide basis, to promote interchangeability, provide flexibility for product changes and facilitate rearrangement. This permits standard components or units to be added, removed or interchanged, similar in approach to the boy with an erector set. Machines possessing this features constitute a long step toward increased flexibility, less down time for model changes, and reduced obsolence costs.

#### Research and Development

Industry today is placing more and more emphasis on research and development. Companies within the same industry are not only competing vigorously for new markets, they are fighting a common battle against ever-rising trends in costs.

Progress in manufacturing research and development is advancing in the direction of methods that minimize or eliminate the amount of metal that must be removed to produce a finished part.
Fiberglass reinforced plastics have
been found to be more economical than
stampings for certain low volume parts
in automobile today.

Development of better tool materials and coolants have made it possible to increase metal removal rate in many operations.

Research has indicated that ultrasonic energy may greatly assist in plating, pickling, deburring and quenching operations. The study of nuclear radiation phenomena leads to a better understanding of chemical and structural nature of substances. Data thus gained contribute to improvement of materials, better fabrication methods and development of new power sources. Thus, technology is moving ahead rapidly.

Dynamic is the word for the present and the years in the immediate future, with new trends playing leading roles in the over-all process of change and growth in manufacturing techniques. Industrial progress is a product of desire coupled with ability—ability to think and ability to work.

From an address given before the Armour Research Foundation, Industrial Diamond Assoc. and diamond tool industry, Chicago, Ill., March, 1956.



Scale models of new production machines and equipment are developed in manufacturing engineering many months before equipment is installed.

#### Simplified Drafting— Pro and Con

For: Peter Sammarco

Advanced Design Engineer International Harvester Co. Chicago, Ill.

Vs: Asst. Dean Jasper Gerardi

University of Detroit College of Engineering Detroit, Mich.

Why adopt simplified drawing methods? Proper functioning of drafting rooms will suffer unless something is done to counterbalance the shortage of engineers and trained draftsmen. In addition, engineers must keep pace with manufacturing and sales progress, constantly searching for new products and processes, a challenge which can be met only through increasing personnel or more efficient operation.

Detail drafting consumes 30 to 50 percent of engineering time, with the remainder used for the more important jobs of design and administration which result in new products. Conventional drafting, full of time-consuming techniques, will not permit a draftsman to increase his rate of speed so as to continue making conventional drawings and still find more time for design and administration.

The answer then is obvious. Drafting methods must be revised. A more practical method of drafting must be found or conceived. What has come to be known as simplified drafting must be used.

This is no new concept. It merely is an emphasis of time-saving techniques. Whatever bible of drafting is used, some deviation in practice occurs and is even encouraged. Liberties that draftsmen take in making a drawing by seemingly unorthodox techniques is done in the name of expediency. He is pressured by demands of today and controlled by standards of yesterday.

The rules for drafting should incorporate agreed-to techniques that permit the draftsman to convey information to the user. The drawing should be a message and not a contribution to an art museum.

Why not collect an organized short cut method? Why not expand them and form them into a workable system which will intelligently utilize a draftsman's time and subsequently, reduce drafting cost? Because the



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drafting practice committees of standards organization, by nature must include in their publications the popular drafting techniques used by industry, they cannot sit in judgment as to what drafting method is best for industry. Industry will decide for itself on the basis of the need for a more practical drafting system, acceptance by the engineering profession and the economy of use.

#### Another Viewpoint . . .

The term "simplified" as applied to standards of any kind, has many interpretations in industry. Many organizations consider reduction or simplification of a variety of items as standardization. Other construe simplification as the reduction of essentials to the lowest common denominator. For instance, it is understood that International Harvester, some years ago, investigated the advisability of simplifying its drawing systems, but found that it required services of special committees to determine the point of demarcation between a simple drawing to which it could be applied, and an involved drawing for which it would be unsatisfactory and confusing. Automotive and aircraft industries had similar experiences, and dissolved committee projects when they found that extreme simplification could not be applied to such products as cylinder blocks, crank cases, gear trains, compressors, fuselages, chassis and other complicated structures.

Long experience with any practice is the most reliable guide to its effectiveness and ultimate economy. Many companies have undoubtedly converted to extreme simplification with immediate savings of drafting time, offset only by time involved in training their personnel. It may be expected that on occasion, misunderstanding as to the intent may arise with rejection of shipments involving tens of thousands of dollars and which may require adjudication as to who is responsible.

If simplification of drafting practice means rendition and calling out of requirements in a manner which cannot possibly be misunderstood, a manner which would be upheld in any court of law and which is practically foolproof, that is acceptable regardless of the short cuts involved. On the other hand, if simplification means diagrammatic sketches which have to be explained to those unfamiliar with the system, a code as it were which requires deciphering, then that is unacceptable and it sooner or later will become too involved for even its most enthusiastic proponents, without considering difficulty and confusion it

Simplification is desirable, based on sound standardization of practice. Engineering societies are working on drafting standards which ultimately will afford a uniform national practice. In those standards, great strides have been taken toward reasonable simplification of rendition, which clarifies rather than confuses the intent.

It appears that the source of drafting room manpower which was normally supplied by engineering colleges will disappear within the next few years and that industry will have to increase its efforts in training personnel for drafting. Everyone will be much further ahead if our efforts are concentrated in the direction of standard practices rather than the type of simplification presently promulgated.

From a discussion presented at the Engineering Institute, Extension Div., University of Wisconsin, Madison, March, 1956.

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#### A New High-Temperature Alloy

By Alan V. Levy Supv. Materials & Process Marquardt Aircraft Co. Van Nuys, Calif.

Searching for a material capable of performing satisfactorily in the 500-700 F range has been a challenge to many aircraft material engineers. A new

material has recently been developed and is in its initial stages of production. This is magnesium base alloy containing 3 percent thorium and 0.75 percent zirconium. It is designated HK31. The alloy is light, one quarter the weight of steel, retains high strength and elastic modulus at temperatures above 600 F, has good creep resistance, can be heat treated and welded, and is available in most shapes and forms.

When this alloy was first announced, Marquardt Aircraft was in initial design stages of an advanced performance, supersonic ramjet engine, Fig. 1. An evaluation program was immediately undertaken to determine capability of this alloy for ramjet design.

In addition to mechanical property tests, many fabrication tests were performed and techniques developed to determine how the material could be applied to typical components. In general, it can be stated that the wrought magnesium alloy can be fabricated with the same practices commonly used with older alloys. A principal difference is the hot forming temperature, which is higher. Minimum bend radii for the sheet alloy is greatly improved by forming at elevated temperatures, 600 F and above.

#### **Fabrication**

Forming experiments were limited largely to rolled parts and spun parts. Fairly large diameters used for ramjet engine design enable most parts to be cold rolled on a set of standard 8-inch rolls, and subsequently welded and spun to final shape, Fig. 2. It was found that, with normal operator techniques, the new alloy could easily be formed to the desired contour.

Considerable work was performed in the field of fusion welding to assure that joints could be reliably used in the high static and dynamic loading conditions required. Fusion welding of the alloy requires a few special techniques to produce sound, high-quality welds. The material, which has been pickled at the mill, when received needs further cleaning prior to welding to remove a very tenacious surface oxide. For metal thicknesses up through 0.125 inch, a single V, 60 deg included angle butt joint design is used. The inert gas arc method of welding was employed wtih argon gas. The most critical requirements are preheat and a specific electrode angle.

Machining studies indicated that standard magnesium practice could be followed with excellent results. Drilling holes in sheet metal for fasteners

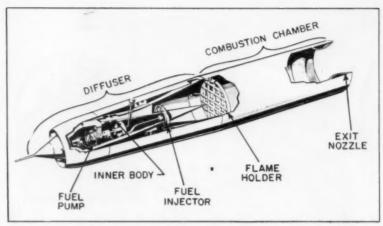


Fig. 1. Initial design of advanced performance supersonic ramjet engine featuring use of new magnesium base alloy.

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For lower temperature applications, zinc chromate primer and phenolic paint are satisfactory.

From a paper given at the Nov. 1955 annual convention of the Magnesium Association, New York City.

#### **Future Course of** Automation

By Elmer W. Engstrom

Exec. V. P., Research & Engineering Radio Corp. of America New York, N. Y.

Greater use of automatic devices to assist human effort in controlling complex production processes is necessary if American economy is to continue expanding.

Today the degree of automation varies widely among industries, and the completely automatic factory is nonexistent. This ultimate form of automation could be described as a large black box into which raw materials and data flow automatically for processing and distribution.

This is still a theoretical concept, primarily for economic reasons. No manufacturer will introduce completely automatic methods if total cost per unit

of work exceeds that of manual methods and mechanization. There is, in addition, the problem of writing off the cost of a completely automatic factory during the period of acceptability of its products.

Today, automation is most advanced in industries such as petroleum, chemicals and certain types of food processing, where bulk materials can be handled in a continuous stream. In industries dealing with unit products, such as automobiles, television sets or household appliances, there is a high degree of mechanization and only the beginning of automation. There is, also, a growing trend in offices toward elec-

FOR AVAILABILITY OF COMPLETE PAPERS WRITE THE HEADQUARTERS OFFICE OF THE SOCIETY NOTED AT THE END OF EACH ABSTRACT.

tronic data handling. In due course, it seems inevitable that machines will be used to integrate data processing within a plant and control some aspects of production and distribution.

During the past era, each trained man was an individual artisan. Increasing automation seems likely to lead to a similar situation. This signals a general upgrading of workers, and following some adjustment, greater employment.

These developments, will in turn, result in greater production, lower costs and wider markets. At the same time, significant changes will emerge in concepts of management. For one thing, much larger capital investment per worker will be required. More information will be available to control processes of production and distribution. This will initiate the change in the pattern of competition within industries.

#### **Meaning of Automation**

Automation is more than a continuing evolution in the direction of greater mechanization. Introduction of electronic control has greatly accelerated the evolution, but has also added a new dimension. Mechanization replaced human skill by machine skill in repetitive tasks. Automation does more than this. It replaces human decision-making functions.

Mechanization has in some respects made the worker part of the machine. Automation reverses this process and frees man's work from routine. It provides increased scope for the exercise



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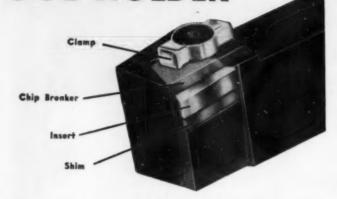
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of man's highest skills. Automation involves the industrial system as a whole. Its development is limited primarily by economic factors involving the state of the entire business situation. It is the only approach now envisioned for obtaining the increased productivity required if the economy is to continue to grow and expand.

Automation will necessitate many adjustments by both labor and management, but will increase the assurance of full use of the contributions of each. It is a way to an expanding economy, to a higher standard of living and to happier living for all.

From a paper given at the U. of Penn. Centennial Symposium on Modern Engineering, Nov. 1955.

#### **Developments in Cermets**

By J. T. Norton

Prof. of Metallurgy Mass. Inst. of Tech Cambridge, Mass.

Cermets are being developed to provide materials to permit higher operating temperatures in devices such as turbojet engines, gas turbines, rocket motors and parts of nuclear reactors.

In the extensive development work, a large number of refractory substances and metals have been combined in a variety of ways. The class of cermets presently in the lead on the basis of practical performance are the metal-bonded titanium carbides.

#### **Fabrication of Parts**

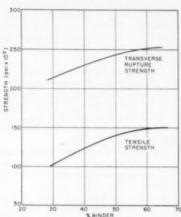
In a typical procedure, purified titanium-carbide powder is mixed with the desired proportion of binder metal, also in powder form, and the mixture is ground and mixed in a ball mill for periods of 2 to 4 days. After grinding, the powder is carefully dried, a small amount of lubricant is added and the powder is pressed. Depending on size and quantity of parts, they may be pressed in a die to final shape with shrinkage allowance for the final sintering operation. Otherwise, blanks may be pressed and then given a preliminary sintering. In this condition, compacts are sufficiently strong to handle and may easily be machined to final shape. The final operation is sintering treatment in a vacuum at temperature just above the melting point of the binder metal. After final sintering, the material is very hard, and except for composition with high

#### tech digests

binder content, cannot be machined. If final finishing is required, it is done by grinding, usually with diamond wheels. An excellent surface finish can be obtained.

#### **Properties**

Tensile tests are significant for purposes of design. As shown by the accompanying chart, the bend-strength values (modulus of rupture) are higher at low binder contents.



Curve showing dependence of transverse rupture strength and tensile strength on binder content for TiC cermets at room temperature.

There are a number of cermet materials of adequate strength in shorttime application, and a few with adequate long-time strength. These are, however, too brittle to meet minimum specifications a designer would set for a practical operating device.

While these conditions may be disappointing, special and important properties of cermets have been revealed which undoubtedly will find applications for these materials.

Another material promises to be a serious competitor in the high-temperature field. This is molybdenum. Alloys of this metal are now in development which have high-temperature properties superior to any of the current cermets. The barrier to their direct application is lack of oxidation resistance. Use of this material is dependent upon finding a suitable method of applying an oxidation-resistant coating. This is not far distant and cermets may well yield the race to coated molybdenum. However the successful coating may itself be a cermet.

From a paper "The Development of Cermets as Structural Materials" 55-A-196, delivered at the Nov. 1955 annual meeting, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

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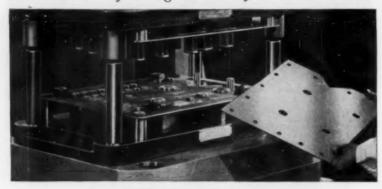
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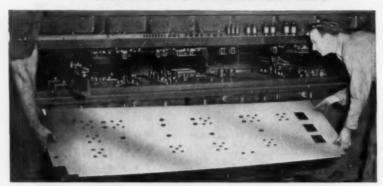
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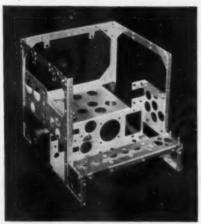
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#### tech digests

#### Process Engineering in **Continuous Flow Industry**

By E. R. Cowherd

Physical Research Laboratory Dow Chemical Co., Midland, Mich.

In the chemical and petroleum industries, a process engineer is seldom involved in detailed design of pieces of equipment, but rather, he is concerned with over-all process and its many implications. Rather than calculate or determine structural and mechanical design of a process, he is interested in such things as:

1. Material balance from which a quantitative flow sheet is developed: that is, quantities and flow of material between components of the process; also, type and specifications of raw materials and

2. Energy balance from which utility requirements of a process are determined, i.e., process and cooling water, steam and electricity.

3. Selection and calculation of unit operation that are necessary to convert raw materials into useful products.

4. Storage and handling of raw materials, products and wastes.

5. Economics of the process.

While the process engineer is directly concerned with modification and improvement of existing commercial operating plants, this work is similar to that which he does in developing new processes, but is less inclusive.

The process engineer must have a good technical background in chemical engineering as he may be called upon at any time to put into practice any of the many things that he has learned in his education. Since he deals in terms of economics of situations, studies of business administration would assist him. These are usually less important than his graduate work. As a process engineer, his ability to think and work in economics will develop.

In his contacts, he becomes familiar with major departments and functions of an industrial enterprise. He works with research and development men on one hand, and production, sales and technical service people on the other. Process engineering thus offers the college graduate an outstanding opportunity to express himself technically as well as in many other ways.

From a paper given at the Detroit meeting, Nov., 1955, American Intsitute of Chemical Engineers, 120 E. 41st St., New York 17, N. Y.



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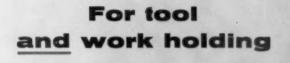
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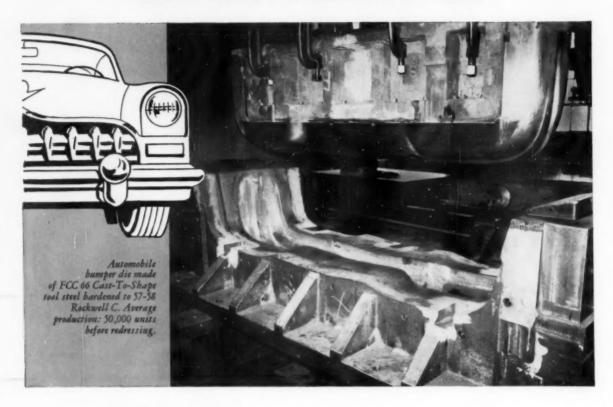


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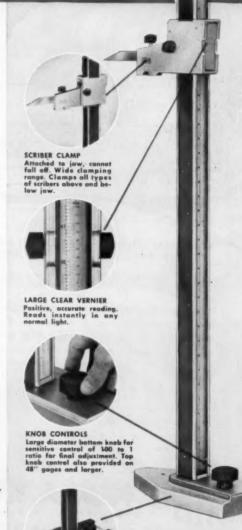
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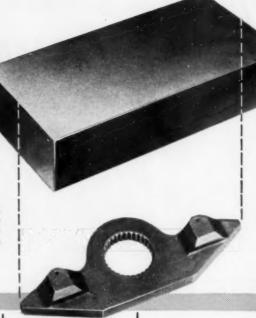
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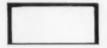


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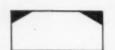
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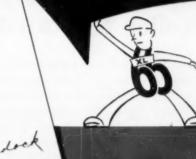
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We not necessary to resharpen the cutters.

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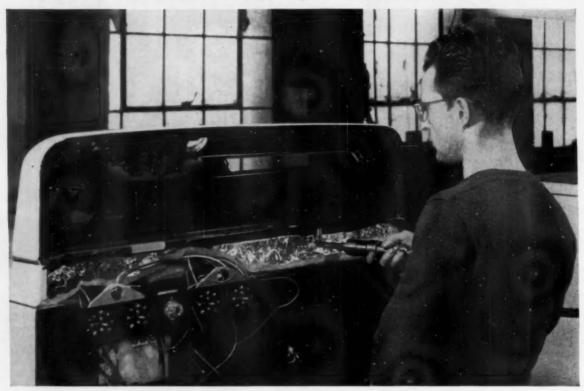
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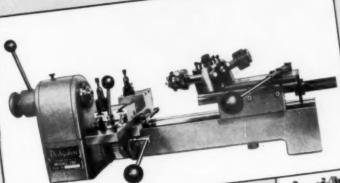
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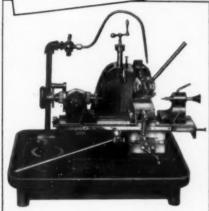
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ELECT LATHE — 18" BED

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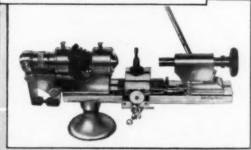
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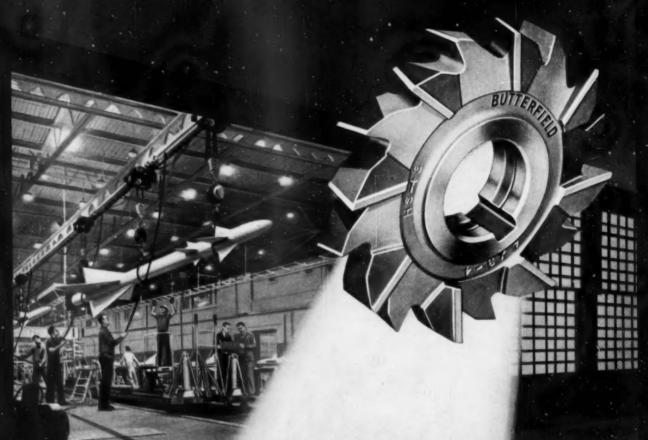


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### LINDBERG INDUCTION UNIT IMPROVES HEAT TREATING PROCESSES AT J.I. CASE...

A single Lindberg 2-station High Frequency Induction Heating Unit at J. I. Case Co., Racine, Wisc., is providing a happy combination of sizeable cost savings and improved quality and production efficiency in heat treating parts for Case tractors. Actually, the dollar savings effected with this Lindberg unit will repay its total original cost in less than 2 years!

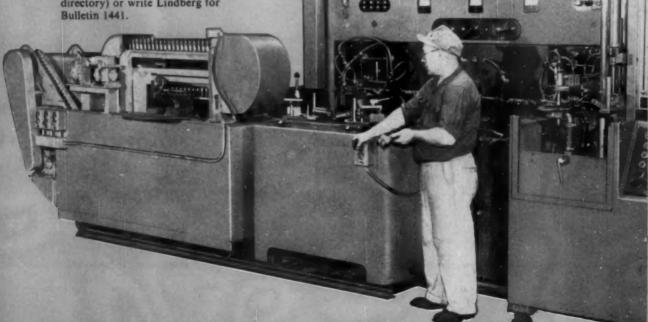
This single unit and the five work fixtures provided with it, working on 2 to 3 shifts, 5 days a week to meet production requirements, heat treat some 63 separate tractor parts. Work fixtures are readily changeable, set-up time is materially reduced, and because of the 2-station design, the unit can operate continuously while work fixture is being changed over on one station.

J. I. Case reports other advantages, too, from this unit: capital investment has been lowered, production has been increased, and, with induction heating better control of case depth and hardness is achieved.

Lindberg Induction Heating Units are designed for heat treating, brazing, soldering and heating, for forming or forging—in machine shops, production lines, heat treating shops—wherever there is a need. If you have a heat treating problem that induction heating might solve why not talk it over with your nearest Lindberg Field Representative (see your classified phone directory) or write Lindberg for

SAVES ½ ITS
TOTAL COSTIN 1 YEAR!

Below is photo of Lindberg unit at d. i. Case with 2 fixtures on station. Fixture in center easily changed as it rolls out on track. Fixture at left is also on track for easy movement on station. Fixture at right is ordinarily kept on station but is provided with rollers it change is required.

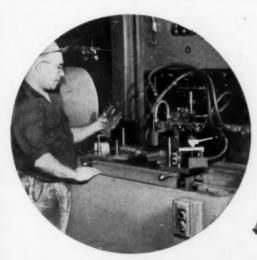




(Above) Hydraulic male coupling is being treated on this fixture. 3 other parts are treated by it, too.

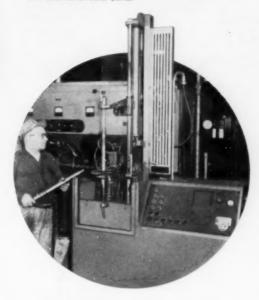


(Above) This shows fixture handling inlet and exhaust valve rocker arms. Same fixture treats 6 other parts-

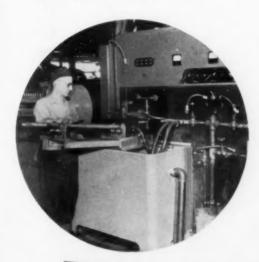


(Above) This fixture is selectively hardening pads and slots on shifter forks. It is also used for treating 17 other parts.

(Below) This fixture is shown selectively hardening a front axle king pin. It handles piece up to 45½" long, 35" of which can be scanned to desired depth. It is also used for 34 other parts.



(Below) Power take-off hydraulic drive shafts are one of the 3 parts treated by this fixture.



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- With the cutting line fully visible, the positive power actuated, self-compensating holddown grips work securely. Multiple pressure feet on 6" centers apply uniform pressure, contacting the work with low impact to safeguard material and bed against damage. Long or short work is held tight against the bed. There's no rippling of the sheet as the keen edged, low-sloped upper knife shears through clean and smooth.
- Niagara's fully closed box section construction of bed, crosshead, holddown and housings plus ample and accurately held crosshead guides resist horizontal, vertical and forsional stresses with minimum deflection.
- Edges are trimmed straight and true within micrometer tolerances. Blanks, too, are cut accurately to size and shape without making compensating allowances when setting gages. Only a Niagara Shear possesses all of the necessary features to insure maximum accuracy!

#### WHY YOU GET THE MOST IN SPEED:

- More working strokes delivered per minute and instant engagement of the Niagara Sleeve Clutch assure more cuts per hour. In continuous feed shearing, quick release of the power driven holddown enables a strip to be cut at each stroke.
- There's no need to adjust knife clearance every time a different thickness of stock is cut. Individual holddown feet are self-compensating. Two sheets of different thicknesses can be cut at the same time with the same knife adjustment and with the same accuracy.
- Ease of operation, quick setting gages and confidence inspired by safety features further increase hourly output . . . and make a Niagara Shear a truly productive, profitable investment for you!

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TOOLING and PRODUCTION MEN



Foot operated models with or without spring return to reverse or to center are \$24.50 list for the ½" and \$25.50 for the ¾" valve less quantity discounts.

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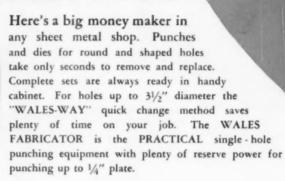
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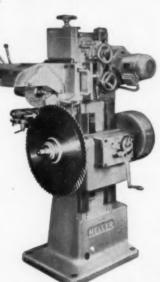
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KNEE AND PLANER TYPE MILLING MACHINES . DRILLING MACHINES . TRANSFER MACHINES

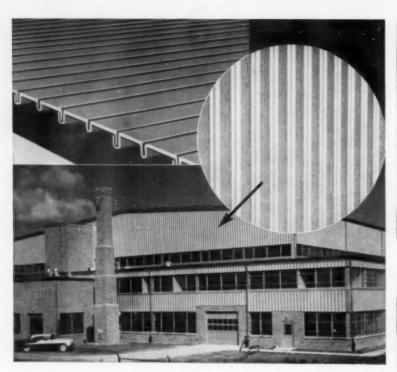
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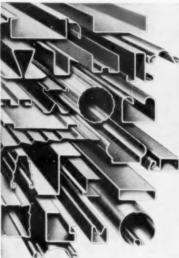


(TOP) Cross-section of cold-roll-formed Roof Deck by Walker Supply & Mfg. Co., Ecorse, Michigan.

(INSET CIRCLE) Aluminum siding panels, (made by Walker Supply & Mfg. Co.) give fine architectural effect.



Elevator Door, Casing and Trim, by Dahlstrom Metallic Door Co., Jamestown, N. Y.



# 1001 things being done by COLD ROLL FORMING

The Cold-Roll Forming Machine is a powerful weapon in the hands of mass-production metal-working industries striving to fight inflationary forces with technological advances.

This applies even to the building industry, long considered immune to mass-production methods. The field abounds in opportunities for cost reduction through cold-roll forming of components for quick and easy assembly and erection on the job. The list includes, for example, specially designed wall, partition, floor and roof

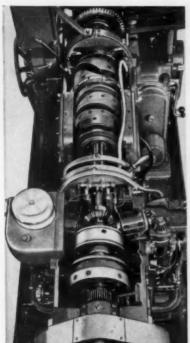
systems, nailable studs and joists, cabinets, closets, windows, doors and trim. It even includes exterior coverings, for architectural beauty as well as insulation and weather protection (see photo above).

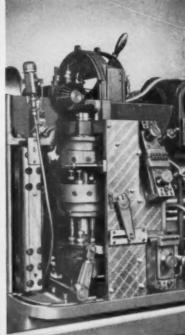
The Yoder Book on Cold-Roll Forming contains numerous illustrations with information on the economic and mechanical possibilities of cold-roll forming, the machines and the tooling. Yoder has long been looked up to as the leader in designing and building all such equipment. A copy of the book is yours for the asking.

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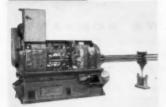


#### Seven Fast Changeover Models

With the prospects of improved tool materials ever decreasing the actual machining time of work on Multiple Spindle Automatics, long runs tend to become short runs. Facility that decreases the time for job changes becomes more important to low-cost production.

Conomatics are available in as many as seven fast changeover models. These are the  $\frac{9}{16}$ , 1", 15%" Sixes, and the 25%", 3½", 5", and 5¼" Fours.

These models are equipped with dial adjustment of working stroke of all slides, without making necessary change of total stroke or positive stop settings. Write, wire, or phone for literature descriptive of these features and other facilities available to users, or prospective users.



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HAYNES STELLITE alloy tools are successful on applica-

tions like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. They resist chipping and spalling in spite of severe shock. Metal removal is fast because high speeds, comparatively high feed rates, and deep cuts can be used.

For more information on efficient metal removal with HAYNES STELLITE tools, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives information on chip formation, tool design, and grinding procedures.

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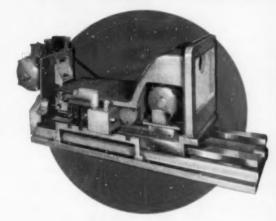
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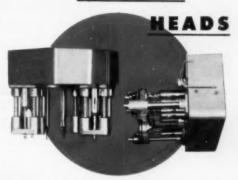
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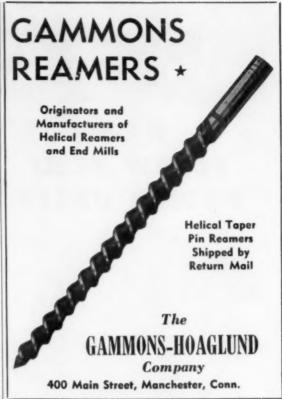
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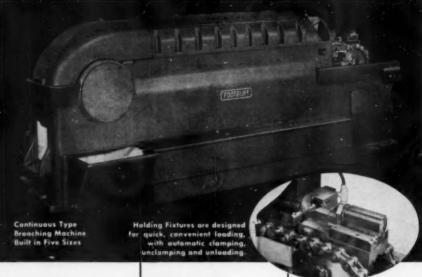
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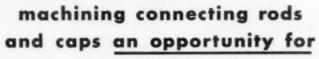












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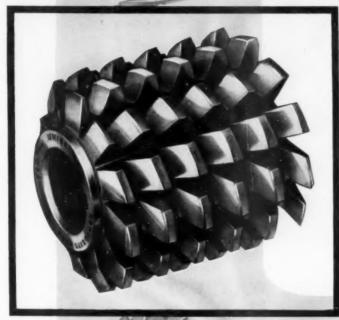
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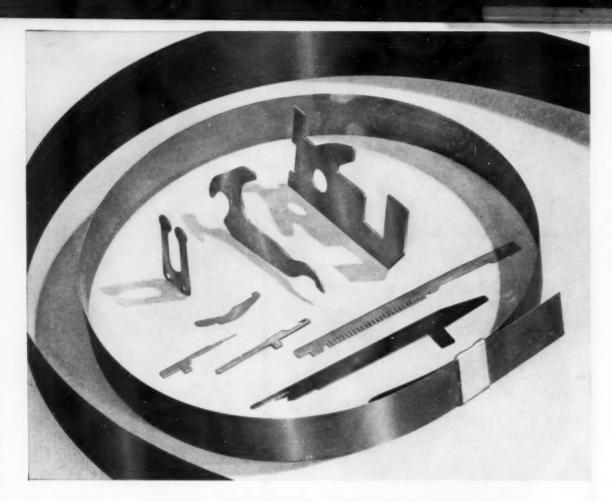


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These precision parts, made for textile knitting machines and refrigerator valves, take a terrific beating. That's why the manufacturers' requirements are so high. Strength, precision, and flatness are musts. And that's why Uddeholm Swedish cold-rolled strip was used to make them.

Furthermore, on large scale stamping runs, like those for making the parts above, it is very important that the strip be uniform in chemical composition, physical properties, flatness, thickness, and finish. And that's another reason Uddeholm filled the bill.

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The Tool Engineer



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Deckel die sinking machines are justly famous for their accuracy, production rate, and ease of operation. The KF12, latest and largest Deckel model, does heavy die-sinking jobs which formerly required much greater investment in equipment. Spindle speeds from 60 to 10,000 r.p.m. enable you to do rough and finish milling, as well as light engraving, on the same machine. The newly developed, "mirror image" milling attachment produces right and left hand dies and molds from the same pattern. Other important features are illustrated below.



Saddle elevating motor rapidly raises or lowers master and workpiece at the same

Circular forming attachment permits generating spherical shapes.

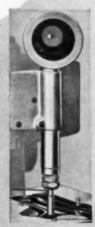
Get in touch with us soon for information on this or other Deckel machines:



Deckel KF12 makes rapid, accurate enlargements or reductions from 1:1.5 to 1:4 as well as 1:1 duplication. The cutting tool covers an area up to 15¾" x 15¾" or up to 10" x 19¾".

Optical contacting device makes rough milling faster, more accurate. And, accurate rough milling reduces time for finishing.





2-DIMENSIONAL ENGRAYERS • 3-DIMENSIONAL ENGRAYERS
UNIVERSAL MILLERS • UNIVERSAL TOOL & CUTTER GRINDERS

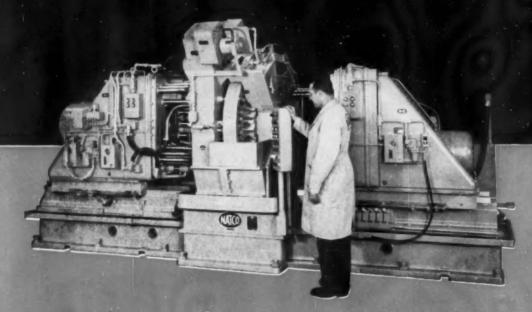
COSA

nationwide sales and service of precision machine tools—
 from bench lathes to boring mills.

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

IN CANADA contact COSA CORPORATION OF CANADA LTD., 1160 Lakeshere Road, Long Branch, Toronto 14, Onterio

# New Natco Performs 17 Operations Every 15 Seconds



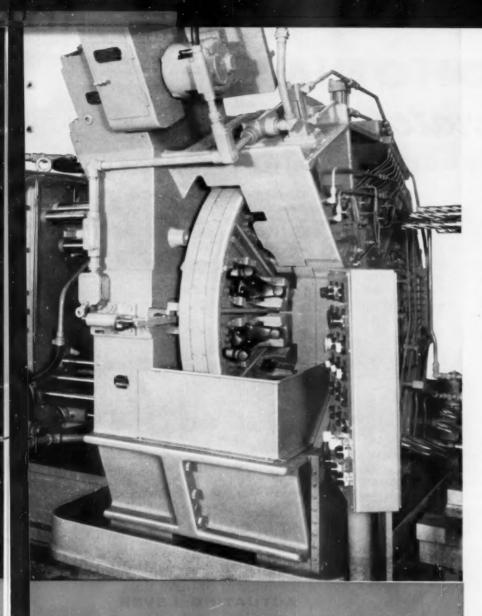
Natco

Performance—this
Natco 2-way horizontal drilling

machine produces 250 steering knuckles per hour. Holds limits as close as .004". Parts are clamped automatically in the interlocked trunnion fixture—spot-drilled, drilled, spotfaced, reamed and counterbored.

Features—Automatic time delay reverse, positive stop, coolant system with magnetic chip separator, automatic lubrication to heads and ways, hydraulic feed and J. I. C. compliance. Let a Natco field engineer help you with your drilling, boring, facing and tapping problems.

Ask for information about the PAYD (Pay-As-You-Depreciate) finance plan.



#### NATIONAL AUTOMATIC TOOL COMPANY, INC.

Richmond, Indiana

Multiple-spindle drilling, boring, facing and tapping machines Special machines for automatic production



Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

#### Notes from Natco...

#### Whole Hog or Piecemeal

Seems like two distinct approaches are being taken in the adoption of automatic assembly methods. The "whole hog" school favors abrupt change... wait until you can install a machine that will handle the complete assembly job. The "piecemeal" school favors a step-by-step transition, starting with the basic transfer mechanism and adding automatic stations one or two at a time.

#### Variety Show

The critics say you can't have high production and versatility, too. But one of our eastern customers has run his drilling show that way for years. On seven adjustable multispindle Natcos, he drills and taps over 1000 different parts in lots from 50 to 10,000.

#### Shuttle for Speed

Like the Three Musketeers, drilling, chamfering and tapping go together. Natco is now building sliding tables for their small standard machines allowing all three operations with one push of the button. Starting in drilling position, table automatically indexes for chamfering and tapping; then returns. Up to 24 operations at a crack.

#### **Processed by Natco Machines**

Part: Gear Housing
Machine: Natco vertical Holesteel
Operations: Drill 11 holes; Counterbore 1
hole; Chamfer 3 holes; End cut ream 1 hole;
Combination ream, face and chamfer 1
hole; Ream 3 holes.
Production: 90 per hour

Part: Cylinder Block
Machine: Natco Holesteel
Operations: Drill 17 holes in 4-cylinder
block or 23 holes in 6-cylinder block.
Production: 40 parts per hour

Part: Shaft
Machine: Natco H-5
Operations: Combination drill and chamfer
3 holes; Drill 4 holes.
Production: 80 parts per hour

# MICROHONING\* Generates...

#### ACCURATE, ROUND, STRAIGHT SURFACES

Truly round, straight surfaces are generated by the application of fundamental principles on which the Microhoning process and equipment design are based:

The combined reciprocating and rotating motion of the tool act on the full length of the bore on every stroke.

The self-dressing abrasive assures sharp grits and cutting at all times.

The tool and bore automatically align themselves.

The feed-out of the tool is positive with equal pressure in all directions from the center line.



All out-of-roundness is removed by the expanding abrasive "cylinder" formed by the rotating tool. Only the tight areas are abraded until all areas have the same radius from the axis.



Wavy or snaky surfaces are made straight by the long abrasive sticks shearing off the crests of the waves.



In tapered bores the abrasives cut only in the tight area until the cylinder has the same diameter throughout its full length.





#### ACTUATING LEVER

Steel Forging • 58 to 60 Rockwell "C" Bore out-of-round and tapered .0015 to .0025 inch.

Microhoning reduces error to less than .00015 inch

Removing approx. .005 inch stock

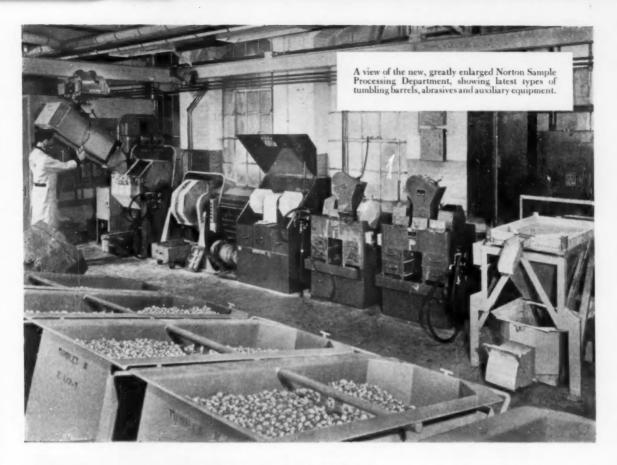
Production—130 pieces per hour

Machine-Model 705-2 Hydrohoner

\*MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish

#### MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE . DETROIT 38, MICHIGAN



#### Find out what barrel-finishing can do for you

Make the Norton Sample Processing Department your proving ground for faster, lower cost production methods

If you're still finishing metal parts the long, hard, expensive way - with out-ofdate tumbling or off-hand methods here's your chance to find out how you can improve product quality and cut production time and costs.

The newly enlarged Norton Sample Processing Department puts at your disposal the very latest advances in barrel finishing - including equipment, abrasives and techniques.

Perhaps you'd like to speed up your deburring or descaling operations. You may have complicated parts. You may want to get a better color on your finish, or a lighter cut on die castings so as not to cut under the smooth outside surface.

Whatever your finishing problems, just send us sample parts — and they can range from tiny needles to hefty forgings. Without charge or obligation Norton production engineers will find out just what tumbling will do for you. Your finished parts will be returned along with a detailed report telling you exactly how to get best results from tumbling in your plant. This includes recommendations as to barrel type, size, speed and time cycles . . . type, size and amount of abrasive media to use . . . proportion of compound or cleaner to water, and other data.

What To Send Us

Along with your unfinished parts

please forward: (a) a finished sample to be matched (hand-finished if necessary); plus (b) information on your present barrel finishing equipment, if any, including type and size of barrel and speeds. Address the Sales Engineering Department, Abrasive Division, NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products ...



NORTON COMPANY: Abrasives . Grinding Wheels . Grinding Machines . Refractories BEHR-MANNING DIVISION: Coated Abrasives . Sharpening Stones . Pressure-Sensitive Tapes



In aircraft and other light metal industries - wherever tooling cost is an important operational consideration - HI-DEN has effected phenomenal savings. Forming, stretch, draw and press-brake dies, Yoder rolls, jigs, fixtures and pressure pads are but a few of the more than 100 successful applications of HI-DEN.

HI-DEN is a laminate of wood veneers impregnated with phenolic resin and compressed under extreme heat and pressure to approximately half its original thickness. The resultant composition — only 1/6 as heavy as steel - is about three times as strong as equal weight of steel yet is easily shaped with standard tungsten carbide tools.

It has high dimensional stability and is virtually impervious to oil and moisture. Used in forming tools, HI-DEN's low coefficient of friction eliminates scratching and burring. HI-DEN treats the metal better and results in far lower scrap.

Our Technical Bulletin and literature show how to get increased production of superior quality products — at lower cost — with HI-DEN. Send for it today.

HI-DEN'S companion
product, parkwood
8000 (a kraft paper im8000 (a kraft pap templates and bench tops. Smooth, hard, but resilient, it won't burr and scratch assem-blies of aluminum al-loys and other softer metals.



USE READER SERVICE CARD; INDICATE A-5-268-1

COLLINS

- SURFACE PLATES ANGLE PLATES
- STRAIGHT EDGES
- . LAYOUT PLATES
- PARALLELS
- T-SLOTTED PLATES



#### for PRECISION INSPECTION APPLICATIONS

Designed by Collins MICROFLAT Company and made from the highest quality Black Granite, these precision granite Plates and Accessories offer the user unfailing accuracy and service at a minimum of cost.

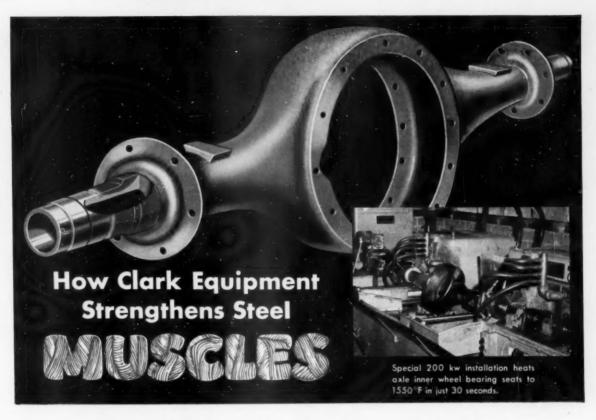
Non-Warping \* Non-Deflecting \* Non-Rusting Write for bulletins describing these products in detail.

COLLINS MICROFLAT COMPANY, INC. 2326 East 8th Street . Los Angeles 21, California USE READER SERVICE CARD: INDICATE A-5-268-2



USE READER SERVICE CARD; INDICATE A-5-268-3





#### with TOCCO\* Induction Heating

Progressive engineers at Clark Equipment Company's Axle Division recently adopted TOCCO Induction Heating for hardening the inner wheel bearing seats of their axle housings. TOCCO\*-hardening is strictly a "quality specification"—part of Clark's never-ending program of product improvement.

Look At These Results! After testing various methods of surface treatment including flame hardening and shot peening, TOCCO induction hardening was selected because the average improvement in fatigue life was greater than with any other type of surface treatment. The improvement in fatigue life with TOCCO equipment is approximately 400%.

In addition to improved fatigue life, surface wear resistance and improved grindability are achieved.

Fatigue test consisted of loading axle housing on spring seats to approximately twice the rated load and stroking at 180 cycles per minute.

Hardening Process					_	_	_		 In	Fa	tig	ue L	ife Over
Shot Peening							6	6	×	*		*	50%
Flame Hardening													300%
TOCCO Induction	He	ırd	en	in	9								400%

In your search for ways to improve your product to meet today's tightening competition, don't overlook TOCCO as a sound means of improving product quality, increasing production speed and lowering production costs.

THE OHIO CRANKSHAFT	COMPANY	NEW FREE	THE OHIO CRANKSHAFT CO. Dept. Q-3, Cleveland 5, Ohio
			Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."
			Name
	IIH		Position
			Company
		A market like	Address
JUST PUST		Took Mak No.	CityState



#### Manhattan Centerless Wheels Handle Roughing and Finishing Jobs—at Top Grinding Speeds

To do both jobs efficiently—roughing and finishing -Manhattan Centerless Wheels are specially bonded. They have a high grit-carrying rubber bond that insures maximum metal removal with every pass—a rubber bond that produces desired finishes to required tolerances even with coarser-grained abrasives. By controlling feed rate and the amount of stock removed you can move from roughing to finishing operations with ease and efficiency . . . without time consuming wheel changes! And be-

cause of the greater strength built into Manhattan Rubber Bond Centerless Wheels you can achieve superior finishes to close tolerances at grinding speeds up to 8500 sfpm! You get a faster, better job-at substantial savings in production time and costs.

Manhattan Rubber Bond Centerless Grinding and Regulating Wheels are custom-made for your specific requirements. Manhattan Regulating Wheels are supplied either plain or core-mounted. Manhattan Core Mountings also provide savings in wheel costs. Ask a Manhattan representative to show you how Manhattan Centerless Wheels and other high speed, heavy duty abrasive wheels give vou "More Use per Dollar".

ABRASIVE WHEEL DEPARTMENT WRITE TO

MANHATTAN RUBBER DIVISION - PASSAIC, NEW JERSEY

#### RAYBESTOS-MANHATTAN,











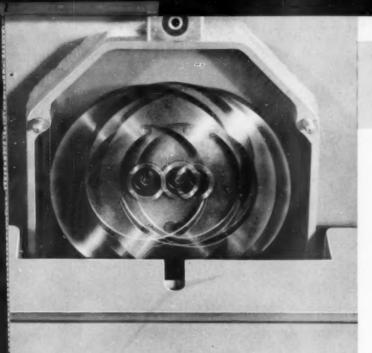








Other R/M products include: Industrial Rubber \* Fan Belts \* Radiator Hose \* Brake Linings \* Brake Blocks \* Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pods and Covers • Bowling Balls



## carbide

Fast WESSON Poweramic grinder requires minimum operator skill

Multiple exposure shows the Wesson "TruArc" grinding wheel oscillation which takes skill out of grinding, produces micro-finishes, speeds tool grinding, eliminates wheel dressing. Stroke is adjustable.

### **Carbide Grinding Made Easy**

Grinding of carbides to hone-like micro-finishes is now reduced to merely placing the tool on the work table and lightly rolling the table into grinding position. That's all.

The Poweramic principle of true-arc wheel oscillation takes the work and skill out of grinding, and produces finer finishes at speeds far faster than any conventional off-hand grinder available in industry today. Further, this principle also keeps the wheel face dressed automatically.

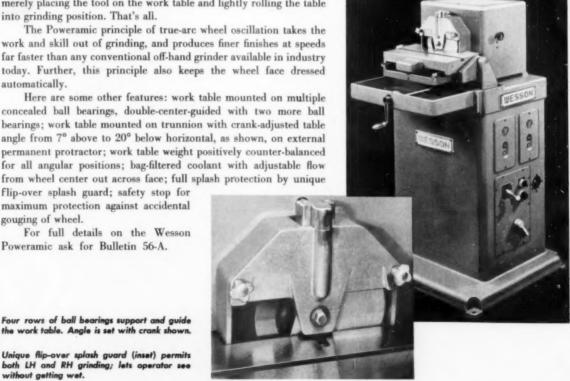
Here are some other features: work table mounted on multiple concealed ball bearings, double-center-guided with two more ball bearings; work table mounted on trunnion with crank-adjusted table angle from 7° above to 20° below horizontal, as shown, on external permanent protractor; work table weight positively counter-balanced for all angular positions; bag-filtered coolant with adjustable flow

flip-over splash guard; safety stop for maximum protection against accidental gouging of wheel.

For full details on the Wesson Poweramic ask for Bulletin 56-A.

Four rows of ball bearings support and guide the work table. Angle is set with crank shown.

Unique flip-over splash guard (inset) permits both LH and RH grinding; lets operator see without getting wet.



#### carbide S

## "A New Dimension In Milling . . . . .



... Cutter Design" is the title of a 6 page bulletin describing the new concept of using "throw-away" carbide blanks in milling cutters rather than regrindable inserts. With blade cost reduced to as little as 17 cents per cutting edge, the bulletin tells of the economies possible in many milling jobs. Included in the concept is a new milling cutter design which permits high speed milling at high feeds, quick set-up; re-setting of blades right at the machine; inventory reduction; etc. Ask for Bulletin 556-B.

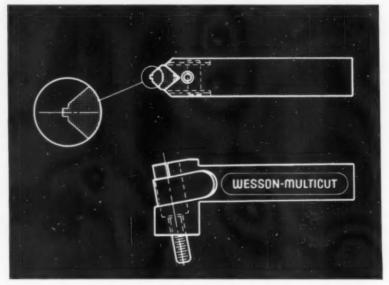
#### Wessonmetal Tooled Crank Lathes Show Tool Life Increase Of 29,900%!

Phenomenal gains in tool life despite almost quadrupled output are reported on Wessonmetal tooled Wickes and Le Blond crankshaft lathes, machining cast crankshafts. Output per tool grind has jumped from 30 cranks to 9,000. Production jumped from 11 to 40 cranks per hour. Wesson Multicut band-type tool holders were used. Tool cost dropped \$1 per crank in one case, could reach total of several million dollars per year in that company, alone.



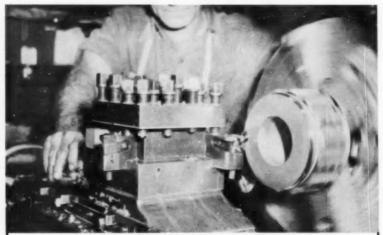
WESSON COMPANY DEPT. AD 1220 Woodword Heights Bird., Debroik 20, Mish. IN CANADA: WESSON CUTTING TOOLS, LTD. 93 LEICESTER AVE., TORONTO 18, ONTARIO

#### Shaft Grooving Costs Cut with New Multicut Tooling



A new line of tools designed specifically for shallow grooving cuts has received such immediate acceptance in industry that it has been adopted practically as a standard for the machining of shallow grooves in automotive transmission shafts,

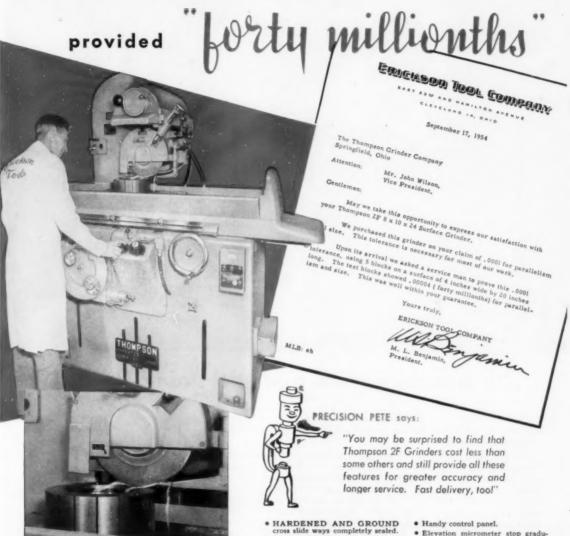
Part of the expanding Wesson Multicut band-type insert holder line, the new tools have 4 "cutting edges" per grind—two at each end. Pieces per grind are way up over conventional tools; set-up and tool change down time is reduced to only a few minutes even for multiple tool set-ups. All replaceable parts except band and insert are standard. For complete data ask for Bulletin #DS-55-2. Insert dimensions are according to customers' needs.



All but 7/100 of one cent of a former tool cost of \$7.98 per piece was eliminated on this tough job through the use of Wessonmetal WS in band-type Multicut holders. The operation—turning and facing a crane gear blank—was formerly done with a combination of steel and carbide (not Wesson) tools. Savings on just the first 4 pieces paid for the complete re-tooling.

#### The Erickson Tool Company asked for at least .0001 for parallelism and size. . .

The Thompson 2F (8x10x24) Super Precision Grinder



"Erickson products are sold and guaranteed to hold extreme accuracy. It is vital that we have the precision equipment necessary to manufacture these products. Our Thompson 2F Grinder delivers this precision. In the above picture we are grinding a #1200 expanding sleeve and hold within .0001 parallelism and size."

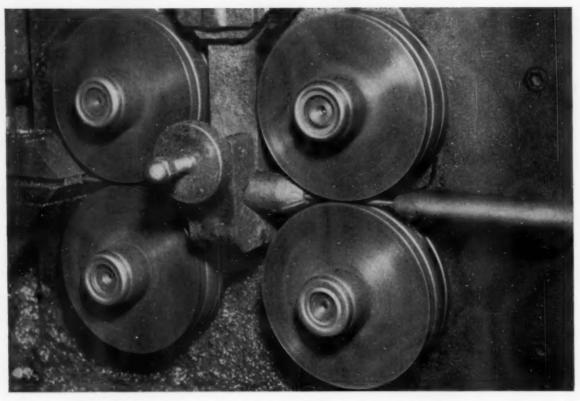
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubri-
- Elevation micrometer stop graduated in .0001"
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- · Longitudinal hand feed with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in

Call, write or wire for estimate

THE THOMPSON GRINDER COMPANY . SPRINGFIELD, OHIO

Thompson **Grinders** 

#### 76 MILLION welding rods through these CROMOVAN feed rolls!



#### 36 months service and still going strong!

CROMOVAN, a Firth Sterling air hardening, high carbon - high chrome die steel is a terrific performer in wear and abrasion resistance applications.

For example, carbon steel feed rolls at Marquette Manufacturing Company, Minneapolis, lasted only seven months even when serviced constantly, but CROMOVAN replacements are still going strong after 36 months of grueling use and no servicing! Four feed rolls guide 14" welding rods (stainless, carbon, and alloy steel) into a flux coating machine at 700 ft. per minute and 76,000,000 rods passed through them with only .022" groove wear and no down time for redressing.

You, too, can realize comparable savings, reduced maintenance, and higher production when you adopt CROMOVAN for feed rolls, guides and wear parts. Write for Technical Bulletin 20-010 or 20-011 (Free Machining), today.



GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30,

MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON OFFICES AND WAREHOUSES": BIRMINGHAM CHICAGO" CLEVELAND DAYTON DETROIT" HARTFORD" HOUSTON LOS ANGELES" NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N. J.



We. Tooley says-

"Firth Sterling offers the advantage of a single source of supply for both tungsten carbides and high grade tool and die steels for every shop tooling purpose. Because we have both you get unbiased recommendations."

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels Sintered Tungsten Carbides Tool & Die Steels Firth Heavy Metal

High Temperature Alloys

# ORTMAN-MILLER

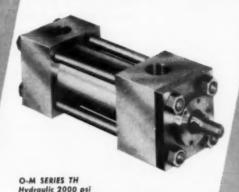
Cylinders

- · Air and Hydraulic
- Meet JIC Standards

O-M Tie-Rodiess (oir-hydroulic) with compact space-saving design, due to O-M Special Interlocking Mechanism, eliminates bulk... saves up to 1/3 installation space. Interlocking feature also makes it easy to orient ports, disassemble, inspect, clean, repair, assemble, thus reducing maintenance.

Available in complete range of sizes (1½" to 8" bores), with standard 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts and mounts, described in Bulletin 101A.





O-M Series TH (heavy duty hydraulic) rated at 2000 psi—features heavy walled seamless steel tubing, microhoned for minimum friction, and rolled steel heads accurately machined and recessed to confine the tube, prevent breathing and to provide additional protection against leakage under most severe usage. Hard chrome plated piston rods. A multiple lip self-compensating rod gland packing, contained in a removable cylinder, facilitates replacement without disassembling cylinder.

Available from 11/2" to 8" bores described in Bulletin 105.

Engineering Service-

Consult on Ortmon-Attiler representative regarding year pneumatic and hydraulic problems. His bread experience with standard and special cylinder applications is available to you without cast or obligation. Use convenient corpor for name and address of O-M representative nearest you. Mail coupon today for Bulletins 101A and 105

#### ORTMAN-MILLER MACHINE COMPANY

13 143rd Street, Hammond, Indiana

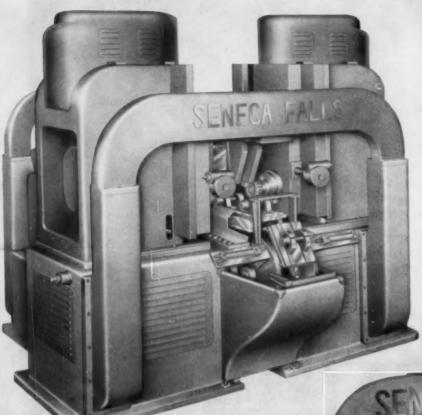
- ☐ Have representative call
  - Send Bulletins 101A and 105

Name\_\_\_\_\_Position\_\_\_\_

Company\_\_\_\_

Address Zone State

#### **NEW...SENECA FALLS AUTOMATIC** TRANSFER TYPE, MILLING AND CENTERING MACHINE



Front view showing milling stations. Loading and unloading of work pieces is done at this end of the machine.

• The new Seneca Falls Model MX Double End, Transfer Type, Automatic Milling and Centering Machine is designed to insure accuracy and reduce manufacturing costs on milling to length and centering operations by combining these operations on a single machine serviced by one operator.

The machine illustrated is equipped for rough and finish milling operations as well as for the centering operations. However, design is such that single, face milling heads may be supplied in combination with other type heads for end milling driving slots in the face of the work pieces " or for combined drilling, reaming, boring, threading and tapping operations in one or both ends of work pieces.

Write SENECA FALLS MACHINE CO., Seneca Falls, N. Y. for Bulletin MX-C

Rear view showing centering station. Work carriers carry finished pieces thru the ma-chine tunnel to the front station.

#### MODEL MX DESIGN FEATURES

- ▶ High production, multiple station, fully automatic machine.
- Standardized tool carrying heads.
- Ease of tool and cutter changing.
- Automatic in-line work transfer from station to station.
- Automatic cycle interruption in case of overload on tools.
- Automatic rapid traverse movement for all tool heads.
- Ease of loading and unloading.
- Automatic power clamping devices.
- Hardened and ground ways for work carriers.
- Motorized chip disposal.
- Simplified maintenance.
- Manual push-button operation.



PROFIT ENGINEERED BY SENECA FALLS



ARE NOW SOLD ONLY THROUGH INDUSTRIAL SUPPLY HOUSES

Write for information and prices on micro, standard and tungsten carbide drill jig bushings, dowel pins, chamfer micrometer gages and portable bench centers.



Sizes from 3/8" to 6" in length-1/8" to 1" in diameter. Standards and specials, including pins of stainless steel



Precision pins, hardened and ground to .0002" or .001" over nominal diameter -oversized: .002", .003", .004" and .005"



Acme Pins are case hardened to 60-62 Rockwell "C" scale and core hardened to 36-38



Acme Pins will break before bending or mushrooming



If your distributor does not yet stock Acme Dowel Pins, please send us his name so we may avail him of a stock. Also ask for Acme Dowel Pin Folder.

ACME INDUSTRIAL COMPANY

208 North Laflin Street, Chicago 7, Illinois • Phone MOnroe 6-4122

#### Tough grinding jobs?

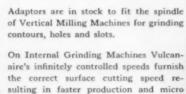
# Check Vulcanaire high speed precision grinding heads!



Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.



ent housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig

finish. The adaptor sleeve fits into pres-

guaranteed, producing Vulcanaire jig grinding of large and small parts. Send us a blue print on your toughest grinding problem. Recommen-



dations and sketches will be re-

turned to you - no obligation.

Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size.

. . . Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.



Vertical adaptor for Sur-

face Grinders, Grinding

Horizontal application. Grinding a shoulder Punch.

#### VULCAN TOOL CO.

7300 LORAIN AVENUE • DAYTON 10, OHIO
USE READER SERVICE CARD; INDICATE A-5-278-1



MADE WITH "MEYCO" CARBIDE KNOW-HOW!

#### PRECISION CIRCULAR CUTTERS!

MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual

applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations... and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal. Write for Bulletin No. 52.



ESTABLISHED 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-5-278-2



USE READER SERVICE CARD: INDICATE A-5-278-3



#### Production efficiency starts with

#### Kearney & Trecker Milwaukee machine tools

This typical example reduced costs and meant higher production for the buyer. Kearney & Trecker's Special Machinery Division's 50 years' experience in machine design and manufacture can mean considerable savings to you.

Take advantage of our abilities. They can pay off in profits for you. See or write your Kearney & Trecker Special Machinery Division repre-sentative. He will be pleased to give you all the details on this production machine. Contact him today!

For more information on machine illustrated, ask for Data Sheet No. 1080. A new bulletin, SMD-56, which describes many of our outstanding designs, is also yours for the asking.





Special Machinery Division MILWAUKEE 14, WISCONSIN, U.S.A.

Designers and Builders of Precision and Production Machine Tools Since 1898

There are no
HIDDEN COSTS
when you Buy

#### SIMONDS

It's Ready to Use!

It's Ready to Use!

Riverst Choice of FLATS and SMUARES

ROUT Stock Sizes Riverst Choice of FLATS and SMUARES

> Ask your Simonds Distributor for a copy of this New Chart (18" x 31") giving full range of Stack Sixes now available

First cost is only part of the story when figuring die steel costs. Bar for bar you save with Simonds. Simonds Flat Ground Die Steel requires no costly grinding to size. It's already precision ground to 1001 stock sizes. What's more it's uniformly annealed and readily machinable. You save on time. You get better results . . . have a choice of OIL Hardening or AIR Hardening type.



OIL-HARDENING TYPE — Non-deforming, spheroidize-annealed for best machinability and consistently uniform hardenability — from Simonds' own steel mill. Extra-smooth finish with all decarburization and surface defects removed. Wide hardening range. Individually packaged (18" and 36" lengths) with simplified heat treating instructions.

treating instructions.

AIR-HARDENING TYPE — Non-deforming, spheroidize-annealed, 5% chrome — more wear-resistant yet easy to machine and heat treat with uniformly excellent results. Another product of Simonds' steel mill. Extra-smooth finish with all decarburization and surface defects removed. Wide hardening range. 36" lengths: Individually packaged with heat treating instructions.

For Fast Service Call your SIMONDS Industrial Supplining DISTRIBUTOR

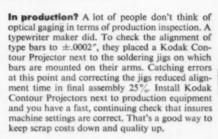
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon, Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lackport, N. Y., Haller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

## How many places in your plant can projection gaging save time and money?



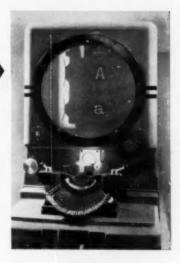
In the toolroom? Look at this. Prior to adopting projection gaging, a Midwestern manufacturing plant required 725 man-hours monthly to inspect flat drills, taps, special cutters, and circular form tools. Use of a Kodak Contour Projector reduced inspection time 84% to 115 man-hours; cost of the projector was returned in direct labor savings within three months. If you have a heavy inspection load in your toolroom, chances are that optical gaging with Kodak Contour Projectors could effect similar savings for you.

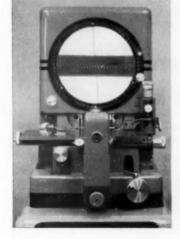
In receiving? Here's the experience of a leading maker of aircraft engines. Their gaging procedure on jet engine blades called for inspecting 11 dimensions (including radii and angles) on the dovetail contour, 14 additional dimensions on the blade root. Using two Kodak Contour Projectors, they checked these pieces at a rate of 150 per hour. And operators required little training. What about your receiving inspection department? Couldn't a fast, highly accurate method of inspecting all sorts of parts with multiple dimensions and complex shapes help prevent bottlenecks?



In final inspection? Ever have a part that was almost impossible to inspect accurately and completely? A leading West Coast electronics manufacturer did. They had to check the precise pitch of a fine wire helix mounted in its glass tube. "Without the Kodak Contour Projector," the company reported, "it would not be practical to make the measurements necessary to get a satisfactory instrument." Many times optical gaging on a Kodak Contour Projector lets you measure small or easily distorted parts with a simplicity and accuracy you can't achieve by other methods.



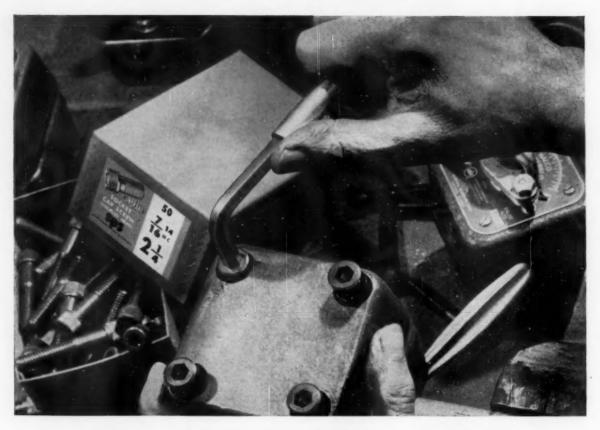




WHATEVER your inspection or measuring problem, there's a Kodak Contour Projector to do the work, from the bench-type Model 8 to the big Model 30 with its 30-inch screen and large part capacity. To find out more about how optical gaging can save you time and money, improve accuracy, send for the booklet, "Projection Gaging with Kodak Contour Projectors." Write Special Products Sales Division.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.
the KODAK CONTOUR PROJECTOR





# Tighten socket screws tighter, more safely with High-Titan UNBRAKO hex keys



High-Titan Unbrako socket screw keys are stronger than ordinary keys. They are made of selected, accurately sized hex stock, with carefully formed 90° bends that won't break. The ends are cut square to engage sockets full depth for highest tightening power. These keys are heat treated uniformly to give hardness and ductility clear through without brittleness or decarburization.

All this results in many advantages. You can torque up a screw tighter with an Unbrako than any other

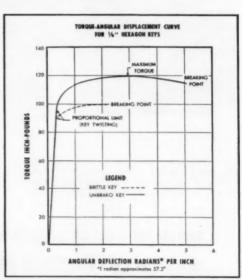
key. Performance is consistent—you can apply the same tightening torque every time. Screw sockets won't ream, and the keys won't wear excessively. If you should apply too much torque, a High-Titan would break, but shear off clean and even with the top of the socket—not at the bend—and without leaving jagged exposed edges to gash your hands.

One High-Titan hex key is included with each standard package of UNBRAKO socket screws. High-Titans are also available as sets in convenient, durable plastic key folds, and in bulk. Your authorized industrial distributor carries them in stock. See him today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 37, Pa.

UNBRAKO SOCKET SCREW DIVISION

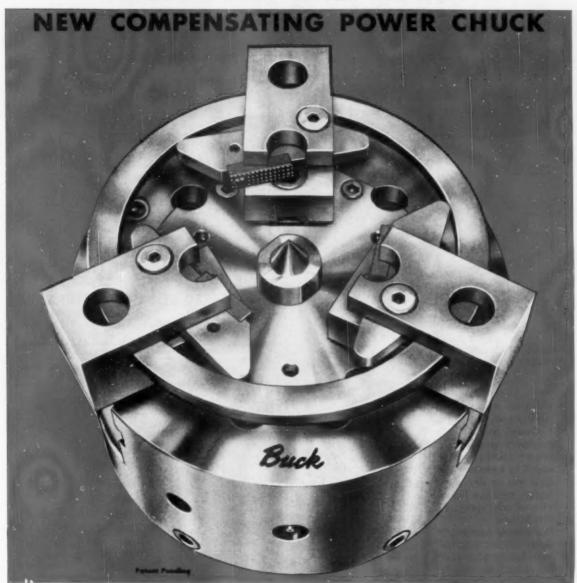
STANDAND PRESSED STEEL CO.

SPS
JERKINTOWN PERMESYLVANIA



THESE CURVES SHOW THE DIFFERENCE between an UNBRAKO hex key and an ordinary key. The UNBRAKO withstands more tightening torque, twists through 180° without breaking, then shears off even with the top of the screw socket. Ordinary keys snap off suddenly at the bend.

## Another Buck FIRST!



#### Ends the Friction that Breaks Centers and Distorts Work

This Buck development begins a new era of greater efficiency in compensating chucks.

Gone is all the friction of internal compensating mechanisms that, in the past, have often forced undue pressure on work to distort it or break centers.

The Buck compensating mechanism move in on work, one jaw pad always makes first contact. This instantly swings its rocker arm to the controlling ring, which in turn brings the other jaws up to contact-with minimum pressure on changed, within practical limits, by rethe work.

The Buck operates equally well with the machine running or not — allows automatic loading and unloading. And its compensating mechanism increases gripping power to permit more rapid stock removal.

Since this is a Buck, the patented Buck Ajust-Tru principle can be

used to position the center absolutely dead true. Work-

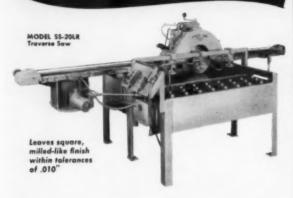
placing jaw pads.

This is also a dual-use chuck. Compensating mechanism can be removed and the chuck used as any Buck Power chuck.

Sizes and prices: 6"-\$475; 8"-\$550; 10"-\$650; 12"-\$700. F.O.B. Kalamamazoo. In ordering give the mean diameter of stock to be chucked so that proper size jaw pads can be supplied.

BUCK TOOL COMPANY holding diameters can be 533 SCHIPPERS LANE . KALAMAZOO, MICH.





#### EXCLUSIVE INTERLOCKED ROLLER-RAIL ASSEMBLY ASSURES COMPLETE ACCURACY ON LONGEST CUTS

This superbly accurate machine cuts up to a full 12 feet in either direction. Locked roller-rail assembly integrates mass of rail and machine for greater rigidity and control, finely finished cuts.

Exclusive Stone Geared-In-Head Drive delivers maximum power direct to cutting edge for top efficiency and greater wheel life. Speed of cut averages 2 to 4 seconds per sq. inch.

Cuts wet or dry with abrasive wheel on ferrous

metals, steel saw blade, with oil mist spray, on non-ferrous.

Our representative will gladly discuss your requirements with you. No obligations: simply write, phone or contact your nearest dealer.

"Cut-off machinery by Stone
... represented in every
major industry throughout the
world"

High Speed Cutting Machinery by Stone includes a complete line for finefinished cutting of ferrous or non-ferrous

- V BAR
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- V TUBING
- V STRUCTURALS
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- V SHEET

STONE MACHINERY CO., INC.
31 Fayette St. • Manlius, N. Y.

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#### IF

You Want to Cut Production Costs . . .

#### THEN

Without Machining, You Can:

- a Anchor Bushings in Drill Jigs
- · Secure Magnets in Fixtures
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- · Align and Secure Shaft Bearings, etc.

Simple Procedures Described in Bulletin A1, Write for it TODAY.

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#### FROM THIS CATALOG



NEW CARBIDE TOOLING PRECISION-MADE

#### Golden-Circle Rotary Tools

New! Elgin's expanded line of burs and rotary files, plus solid carbide end mills, all shapes and sizes precision-made. See how they can meet your requirements at lower cost! Write for your FREE copy of the new "Golden Circle" booklet today!

ABRASIVE DIVISION, DEPT. (S)

ELGIN NATIONAL WATCH COMPANY

Elgin, Illinois

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The Tool Engineer

# McKay's Flex-Roll Processor

Conditions steel prior to fabricating to eliminate stretcher strain, minimize tearing

fabricators, including all the leading automotive manufacturers, have proved the McKay Flex-Roll Processor to be the finest equipment of its kind available to industry today.

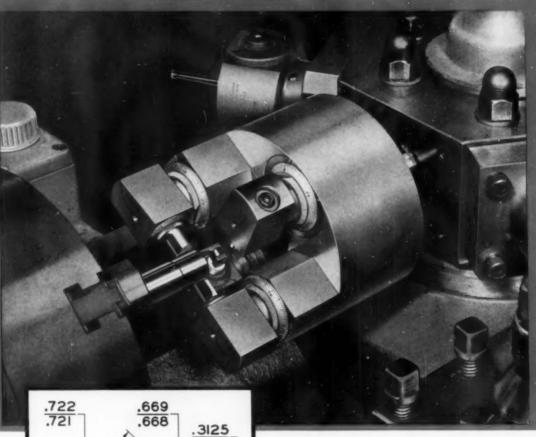
THE NATION'S foremost metal

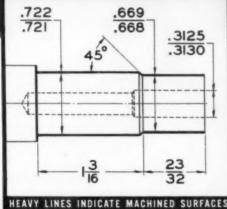
If you are doing any amount of deep drawing, you cannot afford to be without the services of this amazing unit. Let our sales engineers put you in contact with a user in your area... a few minutes of your time will convince you of its value. The McKay Machine Company, Youngstown, Ohio.

SETTING THE STANDARDS OF QUALITY IN METAL WORKING MACHINES FOR TWO GENERATIONS

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# Microbore PRODUCTION TOOLING FOR PRECISION BORING, TURNING and FACING OPERATIONS





Complete facilities are available for engineering and manufacturing special Microbore equipment for all types of producton operations.

#### Microbore Reduces Setup and Machining Times on Turret Lathe Operations

Rates of feed on turning operations were increased 100% by incorporating Box Turning Tool with multiple Microbore units.

Opposed Turning Tools are rapidly set for equally divided chip load by means of micrometer vernier adjustment provided at each tool station.

Each tool is adjusted independently by micrometer vernier principle for radial and linear settings which provide accurate and rapid settings of tools for shoulder dimensions and turned diameters.

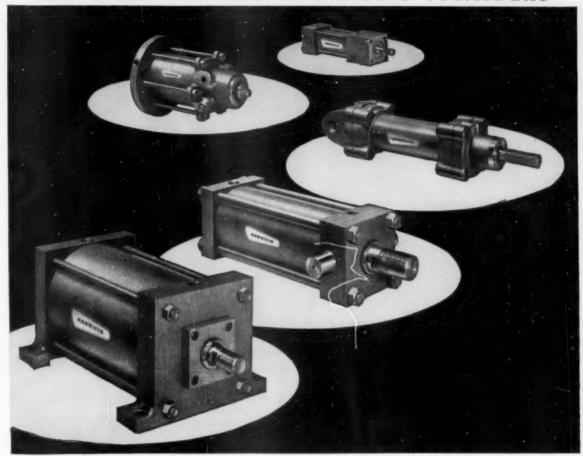
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## To the engineer who wants the best cylinder—in a hurry

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Leadership in Design. Hannifin cylinders are built to exacting quality standards and extremely close tolerances to insure easy, accurate mounting. Hannifin has also introduced the externally removable and replaceable bronze

gland cartridge, the most noteworthy improvement in cylinder design in the last 50 years.

Rapid Delivery. Hannifin can ship the cylinder you need in strokes up to 60" in any normal quantity within 48 hours.

Field Engineers, located in all principal cities, are as near as your telephone. Or, if your requirements are really urgent, call us at Des Plaines. Experienced sales engineers will handle your order.

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MAIL THIS COUPON FOR PROMPT ACTION -

- ☐ Have Field Engineer call at once
- ☐ Have Field Engineer stop by soon
- For the present, just send complete catalog information on Hannifin cylinders including prices



Hannifin Corporation, 519 S. Wolf Rd., Des Plaines, III.

Name.....Title......
Company.....

City......Zone....State......

## Why BALANCED CHEMICAL ACTIVITY in a cutting oil?





The touch of a cutting oil with balanced chemical activity is easily recognized. It's the exceptionally smooth, satiny finish on part after part, even from soft, tough, stringy material . . . and increased tool life.

Stuart's Balanced Cutting Oils have controlled active sulphur and chlorine held in true chemical combination. Each oil is balanced to meet a specific range of job requirements from tapping, threading, gear shaping and gear hobbing to general purpose automatic screw machine work. Stuart oils with high sulphur activity are processed for the more difficult machining of soft, tough, stringy materials such as low carbon and stainless steels, monel metal and jet engine alloys. Oils with lower sulphur activity are designed for high speed machining of free-cutting materials such as B1112, B1113, leaded screw stocks, brass and aluminum alloys.

The "active" sulphur content of Stuart's Balanced Cutting Oils, as opposed to "lazy" sulphur, provides the anti-weld qualities that are so necessary to obtain smooth finishes. The active chlorine and fatty oil content provides the improved lubricity and temperature control to assure the best possible results in production.

Have "the Man in the Barrel", your Stuart Representative, assist you in selecting the right cutting oil for your job. Write for Stuart's Cutting and Grinding Fluid Selector and Dilut-O-Graph Folder, too. It's a quick guide to starting recommendations on any job.

s a quick guide to starting recommendations on any job.

Left. Cupro-nickel bushing, cut in half to show internal threads, produced with a competitive straight oil.

Right. Same type cupro-nickel bushing produced with Stuart's Thredkut X-18—providing controlled chemical activity.





Top: Abnormal front clearance wear of cutting tool caused by excessive sulphur activity of cutting fluid.

Bottom: Cratering of cutting tool caused by insufficient sulphur activity.

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Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

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More than 200 pages featuring the all-new "LEADERSHIP LINE"

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DIE SET CLAMPS

Danly's new "Leadership Line" of die

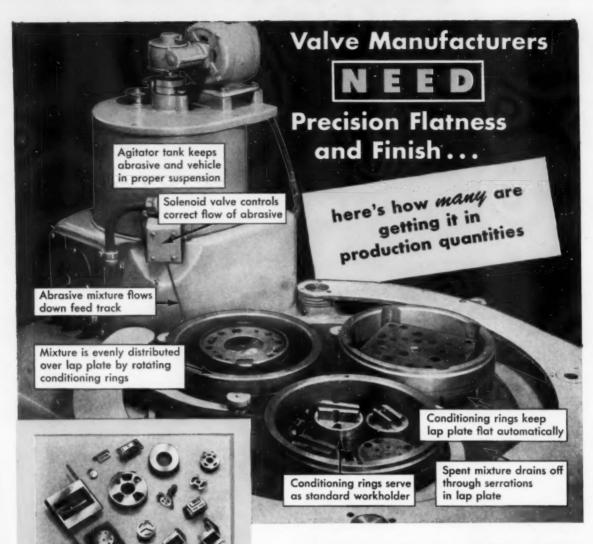
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it a real working tool. Includes all Danly Die Sets, Die Set Accessories,
Diemakers Supplies, Bolster Places and Bolster Accessories making up
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All have found this machine to be the answer to obtaining precision flatness, finish and parallelity in production quantities. Types of valves include gate, slide, hydraulic, solenoid, rotary, diaphragm, etc. The high production accuracy of the Lapmaster

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Here are three booklets that will give you the facts on producing and measuring precision flatness and finish. Write for your copies today.



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CRANE PACKING COMPANY

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TORK-LOK DESIGN . . . Inclined flats in both collet sleeve and arbor shaft.

GREATER ACCURACY... Because flat surfaces are in constant contact on both expansion and contraction.

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CONCENTRICITY . . . Locates straight or tapered holes on true

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## Something more



## than pushbuttons ...

starts the machine-built accuracies in a

Hendey Tool and Gage-Makers' Lathe

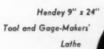
Precision begins with precision!

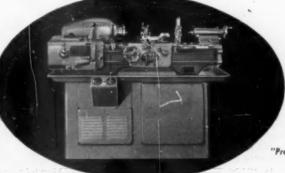
At the left a Hendey worker checks headstock spindle bore alignment of a 9 in. Tool and Gage-Makers' Lathe. But, before he pushes the "Start" button of his machine, he uses most exacting precision to lay out holes to be bored in the headstock. He begins by carefully locating the spindle bore, using "Jo" blocks (capable of measuring in millionths) to assure maximum accuracy. After finding this starting point, he locates other holes in precise relationship to it. Precision machining and finishing are the inevitable result of meticulous preparation and layout.

The 9 in. Tool and Gage-Makers' Lathe can be

purchased with electronically controlled drive to provide quiet, infinitely variable spindle speeds from 15 to 3000 rpm. On facing cuts, stepped diameters, and tapers, operator can change speeds during the cut by selecting correct rpm on the control rheostat. Belt drive gives smooth, vibration-free power to the spindle for extra-fine finishes in the range from 25 to 3000 rpm. Speed range from 15 to 250 rpm is through back gears with very low velocity.

Remember, in your toolroom too — precision begins with precision! You can assure accuracy and reduce turning costs by installing a Hendey Tool and Gage-Makers' Lathe. Call your Hendey dealer now for complete information.





"Precision with Production"

ENGEY machine division
BARBER-COLMAN COMPANY

53 LOOMIS ST., ROCKFORD, ILLINOIS



## the finest precision lathes

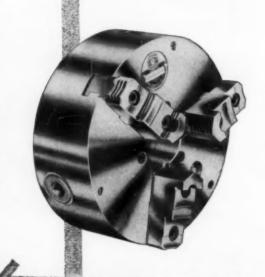


This is the NEW Hendey 32-Speed Geared Head Lathe which represents the finest in accuracy and production, in keeping with Hendey's long-standing reputation for the finest in lathes. Write the Hendey Div., Barber-Colman Co., Rockford, III., for complete information on this outstanding new lathe.

## deserve the finest precision chucks

This is Horton's standard 3-Jaw Scroll Universal Chuck which has contributed to Horton's reputation for chuck leadership for over 100 years. Its precision and lasting accuracy make it a must in any production picture. For the complete story on the complete line of Horton Chucks, see the Horton people in your area now.





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Volkert Stampings, Inc.

#### The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble —especially those equipped with the unique new Owik-Fit Guide Pins\*.

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DIE SET DIGEST, our eightpage quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.



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Wherever die sets are used

## PRODUCTO PRECISION DIE SETS



Van Keuren Light Wave Equipments, standard gage laboratory equipment everywhere, have long been used for checking gage blocks, toolmaker's flats, comparator anvils and other lapped surfaces in the laboratory or inspection room. In recent years, however, VK Light Wave Equipments and flats have become valuable tools on production inspection jobs. Typical is the growing use of optical flats in checking sealing rings of various materials.

The illustration at right of a sealing ring under a 3" diameter fused quartz optical flat shows how easily measurements can be made. The ring\* is acceptable on sight. The bands indicate excellent surface finish (sharp definition of bands), and no warp or low edges (uniform band spacing). Flatness is within .000005" across entire ring, and .00002" across ring face (bands curve less than ½ band interval over entire ring, and 1/6 over ring face).

\*Product of Sealol Corp., Providence, R. I.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:



VK Optical Flat and Seal Ring



37th YEAR

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Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blacks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages , . . Laps and Surface Plates , . . Precision Lapping Service.





now available in commercial quantities

new high strength
OXIDE
cutting tool

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Cuts cast steel, cast iron, chilled iron, carbon steel, high-speed steel, non-ferrous metals

Performance up to ten times the speed and four times the wear-resistance of other tools

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High-Speed Steel In machining high speed steel (207-B annealed) with hardened high speed steel tools, cutting speed was from 80 to 100 sfpm. Stupalox provided a cutting speed of 505 sfpm with .023" feed and .125" depth of cut.

SAE 1035 Steel SAE 1025 steel was cut with tungsten carbide tools at a speed of 250 to 350 sfpm. Stupalox cut the same material on the same machine at 1175 sfpm. Feed was varied from .015 to .005 and the depth of cut

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STUPALOX is the result of thirty years of development of special-purpose oxides, by Stupakoff, one of the country's leading manufacturers of technical ceramic products. Stupalox tools are available now, in commercial quantities, and in a variety of sizes and shapes. Write for complete information and technical data.

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Stupakoff

Division of

LATROBE, PENNSYLVANIA

The CARBORUNDUM Company

## GORTON PRESENTS A Winner!



NEW GORTON 3-48 VERTICAL MILL

#### Compare These Features

#### with <u>any</u> No. 4 Milling Machine

- Designed for high-speed and carbide milling
- 76-inch table; 48-inch table travel
- 46-inch saddle with hardened wear plates at each end
- 241/2-inch Fullwidth knee
- 15/7½ H.P. spindle motor drives spindle only
- 5 H.P. feed motor
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- 3 Feed Ranges available

- Square-Lock bearing guides with long length-to-width ratio
- Dial-type horsepower load meter
- Interchangeable Assembly unit construction
- 100% mechanical and electrical overload protection
- Removable coolant pan for easy clean-out

Above features also available in Horizontal and Universal models.

Write for Catalog 2585, which describes 3-48 Vertical Mills, and 2605-1655 Garton General Catalog.





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Tracer-Controlled Pantographs, Duplicators — standard and special ... Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

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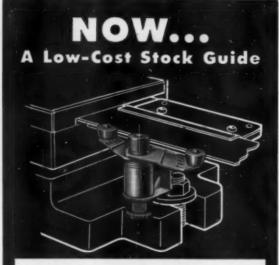
LET HARD - LONG WEARING - FASTER CUTTING





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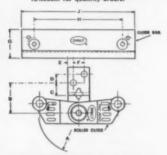
#### **NEW DANLY ROLLER STOCK GUIDES** AND GUIDE RAILS

READY MADE-QUICK TO INSTALL

Versatile...for use on dies or in any operation where coil or strip stock must be guided.

Low-cost ... the cost is only a fraction of the shop expense necessary to tailormake a guide.

Rurred ... constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.



#### Roller Guide Dimensions, Inches

	Cut. No.		В	С	D	E	F
Roller Goide Large	9-70-6	2364	115/2	5%	3/4	5/16	7/16
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Donly Roller Stock Guides pocked one to a box unassembled, furnished with light or heavy-duty spring for aptioned use plus all necessary mounting screws and mounting listractions.

#### **Guide Rail Dimensions, Inches**

	Cat. No.	Max. Stock Thickness	G	Н	,
	9-8025-6	.025	1	3%	4
Guide	9-8045-6	.045	1	31/8	4
Rail	9-8080-6	.080	1	31/6	4
	9-8125-6	.125	1	31/2	A

Deally Guide Rails packed five of one size per box, furnished with mounting screws and dowel pins.

For immediate delivery, specify cutalog number and mail orders to

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A Littell straightener removes the curvature from coil stock. The press, slitter or shear receives a continu uous strip of prestraightened stock. Equipped with variable speed transmissions, Littell Straighteners are adjustable to meet a wide range of speed requirements in automatic feeding. They also simplify hand feeding. A variety of medium and heavy duty models straighten coil stock of all standard widths and thickness.

Write for the Littell Straightener Catala

ROLL FEEDS . DIAL FEEDS . REELS STRAIGHTENING MACHINES . AIR BLAST VALVES

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101 tapper



- An extremely sensitive torque control . . . which signals over-load, stops the machine automatically to avoid tap breakage.
- A pressure lubricated lead
- · Positive precision depth control.
- Air operated clutch with instant reversal.
- A simple non-reversing meter drive.
- Spindle speeds ranging from 35 to 785 RPM.

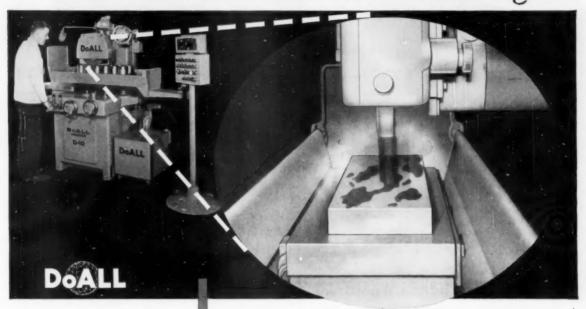
ny additional features are incorporated into the new 101 Series Kaufman Tapper. For more complete, information about this and other Kaufman Tappers, write

KAUFMAN MFG. CO.

553 S. 29th Street Manitowoc, Wisconsin

USE READER SERVICE CARD; INDICATE A-5-300-3

### "Cool Grinding" Proves 1000 Times More Effective than Flood Cooling



#### Mist Provides 1000 Times More Heat Absorbing Surface



A cubic inch of coolant offers six square inches of heat absorbing sur-



Atomized, each of the 1,000,000,000 cubes offers .000006 square inches of surface or total of 6,000 square inches over all.



In "COOL GRIND-ING" coolant is fed to the sides of the wheel. Centrifugal pump action draws the coolant into and through the wheel. It emerges atomized, right at cutting edge.

#### Grind Faster, Grind Accurately, More Confidently

Atomized coolant, as shown at left, is 1000 times more effective as a heat absorbent than liquid coolant. "Cool Grinding" puts this atomized coolant directly at the point of work-wheel contact. Temperatures are reduced as much as 1300°F as compared to flood cooling.

Aids Precision in Grinding—Efficient heat dissipation prevents expansion—helps assure close control of dimension and parallelism.

Ground Parts Last Longer—"Cool Grinding" eliminates burning, checking and stresses—a source of premature failure of ground parts resulting from high heats and quick quenching.

Increased Production—Grinding can be done at faster rates, without heat expansion or damage.

Dry Grinding Visibility—Mist does not obscure work, visibility is unlimited. Wheel Life Increased—Continuous flushing and cooling action in the wheel greatly increases its life.

Standard Grinding Wheels—No need for wheels with "special" arbor holes, Coolant Recirculates—Saves on coolant. Special filter cleans the coolant before reuse.

Free In-Your-Plant Demonstration—DoALL will bring a grinder to your plant and show you how to increase your grinding profits. Write: The DoALL Company, Des Plaines, Illinois

FREE MOVIES—Sound and color to show you the ultimate in precision grinding. Call DoALL locally or write.



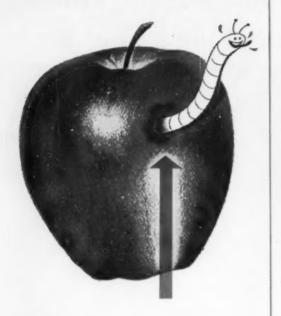
FREE CATALOG—Shows design and construction of DoALL Grinders and accessories including "Cool Grinding".



Friendly DoALL Sales-Service Stores In 38 Cities.

Cool Grinding U.S. Pat. No. 247035





a hole here makes waste...



#### a hole here saves waste

Crucible Hollow Tool Steels save waste—time and money—whenever you need ring-shaped parts or tools with a center hole. For the hole is in the piece when you get it! You eliminate drilling, boring, rough-facing operations—save machine capacity for productive work.

And you can get Crucible Hollow Tool Steels in any of our famous tool steel grades . . . in bar lengths or saw cut to your individual requirements. They are made in practically any combination of O.D. and I.D. sizes. What's more, delivery is immediate with Crucible's popular KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air-hardening, and NU DIE V hot work tool steel grades from warehouse stocks.

Next time you have an application with a center hole, let your Crucible representative show you how these hollow tool steel bars can save you money and time. Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.



first name in special purpose steels

Crucible Steel

Steel Company of America

Canadian Distributor - Railway & Power Engineering Corp., Ltd.

## This is why you need only ONE master!





- 1. One master, only, required. 2. Constant, positive accuracy. Balanced air system posi-tively controlled. It can't drift.
- 3. Dependable stability. Unaffected by surges, or changes
- in air pressure.
  4. Linear, direct reading scale. Not a "go" and "no go" gage. Positively controlled accuracy permits calibrated linear scale having graduations of known value.
- 5. Longer range per magnification .003" and .0015", on 2,500 to 1 and 5,000 to 1

respectively, takes care of 90% of gaging requirements and provides the following

advantages: Greater Plug Clearance. Longer approach range. Longer gage head wear. Greater jet protection.

- 6. Fast, easy setting. Positive setting in ten seconds.
- 7. Easiest to install. Connect directly to air supply. Filter already attached. Pressure regulator assures ample protection - only 40 lbs. pressure required.
- 8. Less maintenance. Gage system better protected. Larger
- jets stay clean. Maintenance negligible if properly installed. 9. Easily adaptable to special requirements. May be combined with electrical and electronic units for automatic gaging and machine

This air gage system is basically different from that of other air gages. One side of this system—the measuring side - is rigidly fixed. There is no adjustment and measurements cannot vary. Hence, the gage is linear over its long range and can be calibrated and set with a single master. Because of this, the Dimensionair is an air gage of dependable stability. It cannot drift . . . throughout its long range.

The balancing side of the system has a single zero adjustment. This enables you to set the Dimensionair positively and instantly to zero, with a single master. Excess bits of dirt, oil or water do not affect the Dimensionair any more than they do other air gages. But. some gages are too insensitive to show up such failure.

If you are familiar with ordinary air gages requiring two masters, you'll appreciate the advantages of using one master. You save half the cost of masters . . . set the gage easily and simply . . . experience, for the first time, the feeling of dependable, non-drifting, precise

The Dimensionair's basic system enables it to be combined directly with electrical and electronic units as used with Machine Control and Automatic Sorting Gages. This obviates the accessory equipment required by other air gages and permits higher speeds, greater precision - with assured stability. It is much easier to set the gage to the spread between electrical contacts; e.g. the spread between the machine's fine feed and the finish feed. Adjusting to zero does not affect this spread

Check these facts for yourself. Have a Dimensionair installed in your plant now.

Compare it with any other air gage you may already own or any you may wish to have brought in for comparison.

> FEDERAL PRODUCTS CORPORATION 6195 Eddy Street . Providence 1, R. I.

> > Federal's solution to the

Impartial Gage Selection

Engineering Follow-Through Everything In Gages

cost of gaging:

## TAR FEDER

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic-for Inspecting, Measuring, Sorting, or Automation Gaging

**Federal Products Corporation** 6195 Eddy Street, Providence 1, R. I.

We'd like to test a Dimensionair in our plant.

Company Name.

Your Name

Title

Address..

#### Scully-Jones Adjustable Adapters

#### FOR PREMIUM PERFORMANCE OF DRILLS, TAPS, REAMERS

#### AT NO PREMIUM IN PRICE!

for these reasons	result from these PREMIUM features		
No "cocking" or spindle	1. Top face of quick-lock nut is square with threads.		
distortion	2. Locking shoe assures even distribution of pressure on all mating threads.		
Cutting tools run true	g. Bore and shank are concentric within .002 in. gaged 6 in. from adapter.		
Faster adjustment	4. Quick-lock nut locks any place on thread by only ¼ turn of set screw.		
	5. Pilot nose eliminates "binding."		
Faster tool changes	6. Keyhole-type drift slot simplifies tool ejection.		
	7. New Lock-and-Eject type eliminates use of conventional drift.		
Full use of adjustable range of adapter	g. Quick-lock nut is thinner than nuts used on most adapters.		
	9. Small diameter permits use on close centers.		
Reduced tool breakage	10. Keyhole-type drift slot eliminates need for hammering with conventional drift.		
	11. Friction-type nut prevents thread damage Set screw does not contact threads.		
Adapter lasts longer	12. "Stressproof" steel induction hardened to give best combination of wear resistance and toughness.		
Solve pull-out problems	13. New Lock-and-Eject type increase holding power.		
	No "cocking" or spindle distortion  Cutting tools run true  Faster adjustment  Faster tool changes  Full use of adjustable range of adapter  Reduced tool breakage		

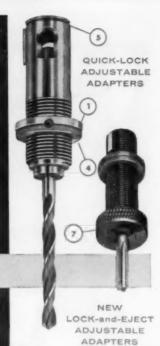


Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

#### PRECISION HOLDING TOOLS

"Precision Holding" for holding precision

Scully-Jones and Company, 1915 South Rockwell Street, Chicago 8, Illinois



SPINDLE
EXTENSION
ASSEMBLIES

6

Style 1800—
small body die

small body diameter for use on close centers and next to shoulders.

Style 1900—has larger body diameter and inside taper.



(Sliding guard removed, wheel guard raised, and coolant flow reduced.)

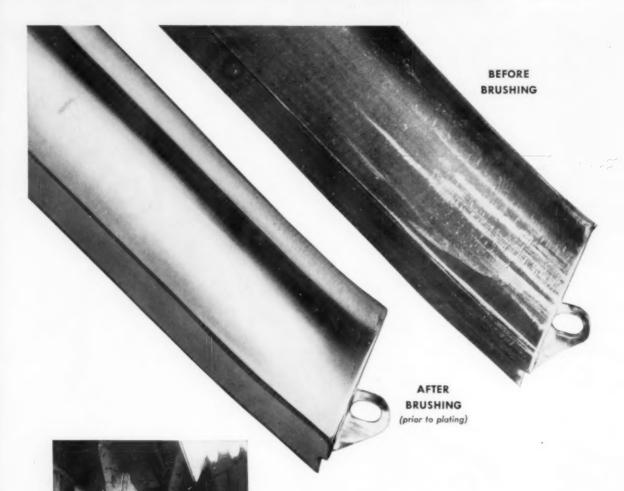
PHOTOGRAPHED AT COLE CARBIDE INDUSTRIES, ROYAL OAK, MICH.

CARBORUNDUM'S Diamond Wheels are by far your best choice for grinding cemented carbide tools. On this rotary table surface grinder, a B7 Resinoid Bond Diamond Wheel permits maximum production rates without risk of checking or cracking the carbide . . . cuts exceptionally free and cool ... requires less pressure between wheel and work to achieve accurate size control. CARBORUNDUM also produces a topquality line of metal bond Diamond Wheels for offhand work and cutting off. Ask your CARBORUNDUM Distributor or salesman for your free copy of Form A-1208, an authoritative 40-page booklet on "Grinding Cemented Carbides". Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar





 $\mathbf{M}^{\mathsf{AKING}}$  a metal product, you undoubtedly use the smooth, mirror-lustre of chrome trim to add eye appeal—and buy appeal—to your product.

And you can further enhance the top-quality appearance of your trim parts—and your product—using Osborn power brushing to produce a perfect, unmarred finish prior to plating.

An Osborn Brushing Analysis of your other finishing operations may point up additional ways power brushing can help improve quality. Write The Osborn Manufacturing Company, Dept. K-23, 5401 Hamilton Avenue, Cleveland 14, Obio.





BRUSHING METHODS . POWER, PAINT AND MAINTENANCE BRUSHES BRUSHING MACHINES . FOUNDRY MOLDING MACHINES

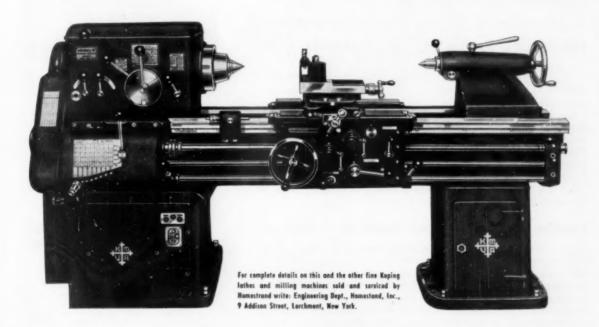
#### HIGH SPEED LATHE

Designed to meet today's demands for greater stability, more power and higher spindle speeds, the Koping S 8 B is one of fourteen types manufactured in seven sizes. Wide bed casting with high rigid walls braced by strong diagonal ribs. Saddle and tail stock are mounted on separate flame-hardened V and flatways.

The unit features automatic releases on longitudinal and cross feeds. The spindle, which is made with a type L 2 nose has no gears or clutches mounted on it and runs on special precision cylindrical roller bearings with front bearing 4% in diameter.

**58B** 

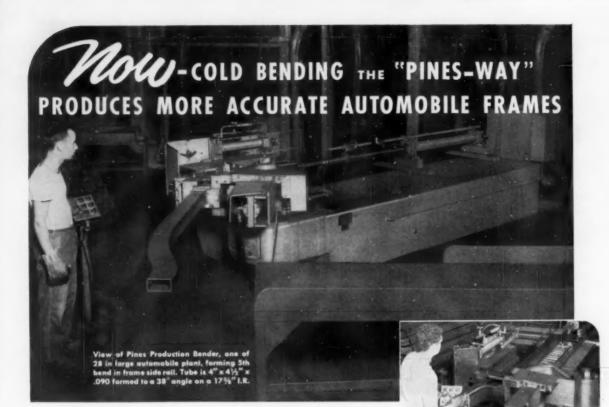
#### SPECIFICATIONS



KOPINGS MEKANISKA VERKSTADS A.B. SWEDEN Jomestrand

LARCHMONT, N.Y.

Note Beater inquiries invited. Several territories available.



#### Production Bending Methods Simplify Fabricating Problems, Cut Assembly Costs

● The unusual versatility of Pines Bending Machine methods is again demonstrated by the successful production line application shown above in a large automobile manufacturer's frame plant. Proven by more than 18 months of operation, a battery of 28 special Pines Benders are now forming .090 tapered welded steel tube frame members at a rate of 120 bends per hour. These machines and ingenious tooling, designed and built by Pines, form a total of seven bends in each side rail member and produce more accurate parts than ever before possible. The end result is a stronger, more accurate chassis that is much easier to assemble to the car body.



This revolutionary new manufacturing method is the result of long months of cooperative efforts between Pines and automotive engineers. It is typical of the consistant progress being made in profitable application of cold bending in the manufacture of a wide variety of metal products. It may also pay you to investigate the design possibilities and the production advantages of cold bending the "Pines-way." At your first opportunity call in our Sales Engineers for free survey.

A Close-up view of machine used to produce 4th bend in long side rail member. Five different bends are made in this piece, each in sequence on separate machines. Accuracy is held within .030" to .045" at seven check points. Spring-back is easily controlled by simple stop settings — an important factor that cuts tool costs.



A View of a flexible articulate mandrel used for making a bend at a right angle to, and within, a previously bent section. Mandrel is eutomatically inserted and expanded. Insures smooth, neat bends.



Write FOR MORE DATA

If you would like case study data on production bending, write today for free copies of Pines News.



PRODUCTION BENDING . DEBURRING . CHAMPERING MACHINERY

OK multi-operation tools—
more beef in the body

One man,
one machine,
one pass,
now does the work of six
A winning combination to reduce costs...
OK modern milling cutters
mounted on modern milling machines

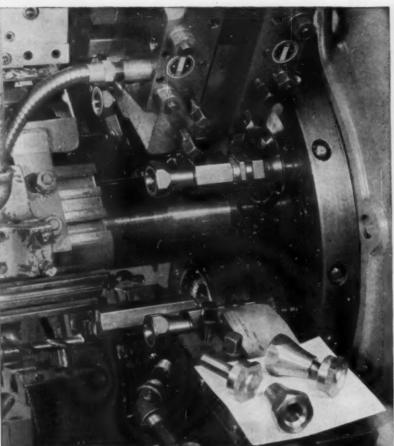


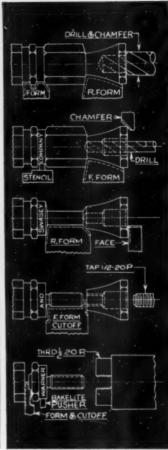
THE OK TOOL COMPANY, INC.

300 Elm Stree

Milford New Hamushire

FREE: FIFTY PAGES OF NEW ENGINEERING PRINTS SHOWING ADVANCE INEAS IN MULTIQUE





## Warner & Swasey 5-Spindle Automatic produces complex 2-piece job in one cycle!

THIS JOB demonstrates the versatility of the Warner & Swasey 5-Spindle Bar Automatic in producing complex jobs that also require heavy metal removal ability.

This machine can produce both parts of this jack screw almost simultaneously. After taking the form cuts, one piece is tapped and cut off in the fourth position, and the second threaded and cut off in the fifth position. The entire operation – 43.4 seconds!

The 5-Spindle Automatic's longitudinal slide with 5 tooling stations and the 2 auxiliary slides provide a total of 7 end-working tool positions. Add 5 independent cross slides, including the cut-off slide, and you have a total of 12 tooling stations for the 5 spindles. High-speed drilling attachments can be mounted in all positions

--and threading, tapping and reaming attachments are available for the third, fourth and fifth positions, if required.

Camless design of the 5-Spindle Automatic provides quick changes of all strokes, and feeds and speeds. Strokes are quickly set with the parented quadrant control mechanism, using simple linear scales. Speeds are changed by quick change gears and feeds by shifting sliding gears in the feed box.

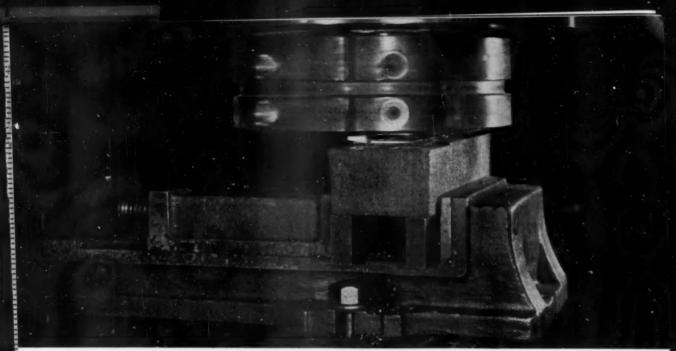
On complex jobs like this, and many simpler ones, the quick setup of Warner & Swasey Multi-Spindle Automatics will pay off for you—even on medium and small lot work. To find out more about the adaptability of these machines to your own work, call in your Warner & Swasey Field Representative.



1¾" Standard Bar Capacity 2¼" Oversize Bar Capacity



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY



Wear land comparison tests prove Grade 860 provides greater resistance to chipping, cratering. After milling 72¾ lineal inches on a cast-iron block with interrupted cuts to simulate cylinder blocks, wear on Grade 860 is minute. Two typical carbides tested under identical conditions show extensive chipping. Speed – 377 fpm. Feed – .0096″. Table travel – 1¼ ipm. Depth of cut – .100″.





Grade "A" - .035" wear, some chipping



Grade "B" - .625" chipped



On high-tensile gray cast irons...

## TOUGH, NEW CARBOLOY MILLING GRADE 860 GREATLY REDUCES CHIPPING AND CRATERING

Carboloy<sup>®</sup> Milling Grade 860 was specially developed to provide longer tool life on the harder, denser types of gray cast iron now coming into common use.

Stronger cutting edges make Grade 860 far more resistant to chipping and cratering than any other available carbide. Tougher internal structure provides longer tool life and more production per grind.

Improves production 20-30%

Carboloy Grade 860 has been tested for almost

a year on high-tensile cast irons ranging from 223 to 248 Brinell hardness. Despite scale and interruptions, this new carbide has consistently outperformed ordinary grades by 20-30%.

At speeds ranging from 250 to 300 fpm, Grade 860 produces excellent finishes. It is especially efficient for face milling operations, and can also be used to advantage for plain milling.

Specify new Carboloy Grade 860 for your milling cutters. For more details or technical information, write today . . . or mail the coupon on page 4 of this advertisement.

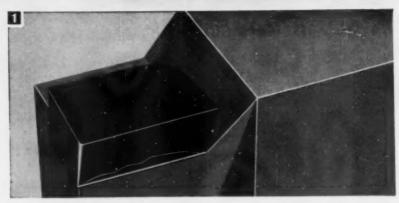
CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

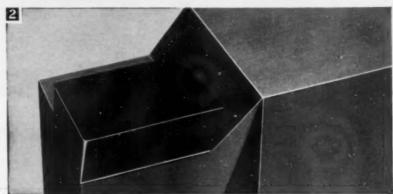


#### BRAZING CRACKS ELIMINATED

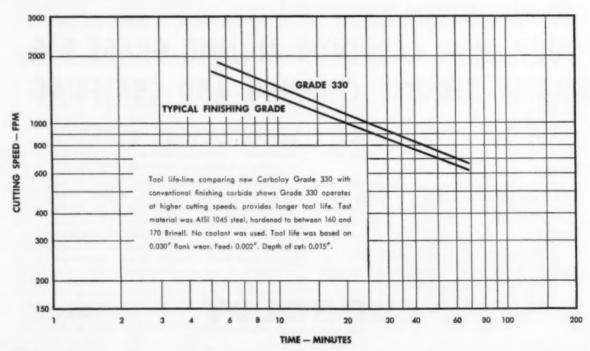
Conventional carbide (Figure 1) shows type of brazing crack that can greatly reduce tool life and increase machining costs.

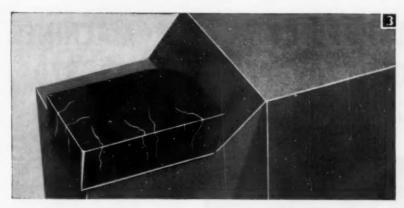
Carboloy Grade 330 (Figure 2) uses nickel binder to provide greater strength and toughness to resist brazing strains. For further protection, the wholly new composition of Grade 330 permits the use of high-silver solders with lower melting points. (Photos have been retouched to bring out brazing cracks difficult to see with the naked eye.)

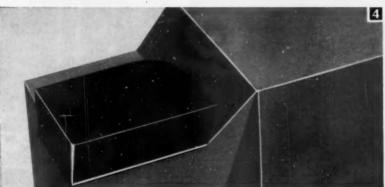




### **NEW CARBOLOY STEEL-FINISHING GRADE 330**







#### GRINDING CRACKS ELIMINATED

Ordinary steel-finishing carbides are so brittle that grinding cracks (Figure 3) frequently appear. Automatic grinders cannot normally be used.

Because Grade 330 (Figure 4) has twice the transverse rupture strength of ordinary carbides, it has superior resistance to grinding cracks, can be easily ground on duplicating-type grinders. (Photos have been retouched to bring out grinding cracks difficult to see with the naked eye.)

#### MACHINES FASTER, WEARS 20-35% LONGER

- Easier to braze and grind
- Double transverse rupture strength
- More resistant to chipping, cracking

With a transverse rupture strength of 200,000 psi, new Carboloy Finishing Grade 330 is nearly twice as strong as conventional steel-finishing carbides.

Used on finishing and boring jobs, this extra strength means greater resistance to chipping and cracking, along with improved tool life.

#### Entirely new composition

The secret of Grade 330 is its higher titanium-carbide content and nickel binder. Grade 330 is tougher, easier to grind, and more wear resistant than cobalt-binder grades.

sistant than cobalt-binder grades.

Production tests on AISI 1045 steel (see chart at left) show Grade 330 can be operated at

speeds 10% higher than other carbides without any loss in tool life. When compared at speeds ranging from 600 to 1900 fpm, Grade 330 consistently provided 20-35% longer tool life than other grades.

#### Extra-performance steel-cutting carbides

Grade 330 rounds out the Carboloy extraperformance Series 300 carbides (Grades 350, 370), taking up on finishing and boring where Grade 350 leaves off.

Throw-away inserts, standard blanks, square and solid boring tools are now available from Authorized Carboloy Distributors. For price list and specifications on Grade 330, send the coupon on page 4 of this advertisement.

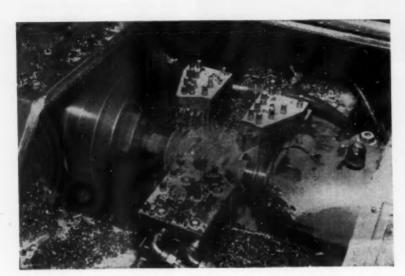
CARBOLOY



## GET MORE OUTPUT FROM YOUR MACHINES WITH CARBOLOY GRADES 350 AND 370

Remove more steel per minute

Reduce downtime and tool costs





Edwards Valve Division, Rockwell Mfg. Co., found that interrupted cuts on 207 Bhn steel limited production to 25 pieces per edge with former carbide. After switch to Grade 370 inserts, production jumped to 40... an increase of 60%.

SETUP: Material - 4140 forged steel. Speed - Over 400 fpm. Feed - 0.009". Depth of cut - 1/4" to 1/2".

Carboloy Grades 350 and 370 are extraperformance carbides. They are specifically designed to take heavier, deeper cuts at faster speeds... to provide maximum machine output at lowest tool cost.

Hundreds of in-plant case histories like the one above have proved Grades 350 and 370 consistently outperform, outwear all other steel-cutting carbides.

#### Greatly increase output

Even on the toughest jobs, these carbides have brought production increases ranging from 30% to 300% . . . reducing the cost per finished piece.

Carboloy Grades 350 and 370 have a built-in

structural rigidity that resists edge deformation even at temperatures as high as 1800° F. Their ability to stay on the job longer means less downtime, more production from the machine.

#### Complete stocks available locally

Try medium-duty Grade 350 and heavy-duty Grade 370 on your steel-cutting jobs . . . and lower your tooling costs.

Your local Authorized Carboloy Distributor maintains complete stocks of both these grades in a wide range of tools, blanks, and inserts. His name is listed in the Yellow Pages of the phone book. For more information, call him today or mail the coupon below.

#### CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY
11101 E. 8 Mile Blvd., Detroit 32, Michigan

Send me more information on:

- New Milling Grade 860
- ☐ New Finishing Grade 330
- Grades 350 and 370
- Send the name of the nearest Authorized Carboloy Distributor

Name\_\_\_\_\_

Company

Address

City Zone State

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

## Make speed reduction A COST-REDUCTION FEATURE

of any drive design

When you design around the 100 SERIES, you can be sure that any model you need is available promptly, — from stock. You can be sure, also, that any BOSTON GEAR Speed Reducer will take top-rating in any test for operating efficiency, and lasting power economy.

Get complete information . . . call your local BOSTON GEAR Distributor and talk to the transmission specialist. Boston Gear Works,

74 Hayward St., Quincy, Mass.

1064 types and ratios FROM STOCK

BOSTON, ews.

SPEED REDUCERS

#### RATIOMOTORS

Output RPM .49 to 175



Herizontal Right



Double Reduction Harizantal Parallel Drive

#### REDUCTORS

Ratios 1:1 to 3600:1 Fan-cooling optional on larger sizes



Herizontal Right Angle Drive Worm Gear over



Double Reduction fortical Right Angle Drive



Horizontal Right Angle Drive



Vertical Right Angle Drive



All Ratiomotors are sold also WITHOUT MOTORS as

#### FLANGED REDUCTORS

You buy and attach motors of your choice



Double Reduction Horizontal Parallel Drive



Double Reduction Vertical Right Angle Drive

Ratiomotor "COMBINATION" design permits easy motor change . . . continued operation with spare. Motor is easily detachable, can be changed in minutes. Gear unit is undisturbed, preserving alignment. Also, original motor can be replaced with another type (explosion-proof, etc.) at anytime.

At the Philadelphia
DESIGN ENGINEERING SHOW
visit BOSTON GEAR Booth No. 514

CALL

BOSTON COL

For nearest Distributor, look under "GEARS" in the Yellow Pages of your Telephone Book.

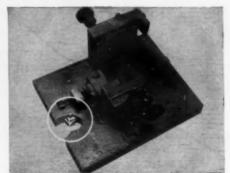
Ad No. 568G-R-20A

## What can be done to lower YOUR tooling costs?



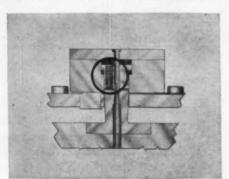
CLAMPING OFF-ANGLE PARTS in jigs and fixtures is a cinch with Vlier Swivel-Pad Clamps. Pad swivels on a ball, 7½° each side of center line. Can't bind or damage part surface. Socket set models can be inserted from either end.

Thousands of companies are making drastic savings by using standard Vlier Tooling
Specialties instead of costly custom-made substitutes. The applications shown below are only the *obvious* uses for these simple, inexpensive tooling specialties.

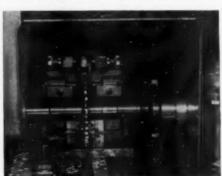


PERFECT ALIGNMENT OF JIGS AND FIXTURES ON MILL TABLES is assured every time with Vlier Fixture Keys. Each key is precision machined to three table slot dimensions, enabling the job to be run on any suitable mill in shop.





NEED ACCURATE, UNIFORM SPRING LOADS? Vlier Spring Plungers really pay off when positioning parts in jigs and fixtures. Spring loads are accurately set at the factory; stay constant. Plunger telescopes completely.



THE RIGHT AMOUNT OF CLAMPING PRESSURE AND NO MORE! There's no distortion of the part when Vlier Torque Thumb Screws are used to clamp it in the jig or fixture. Once predetermined end pressure is reached, the head turns freely. Working parts are protected from foreign matter.



#### Where can your tool room save?

Chances are, you can think of dozens of uses for standard Vlier Tooling Specialties—applications where expensive, complicated, home-made devices are now being used.

Why not write for your copy of the new 1956 Vlier catalog today?

Originators of small parts that make a big difference in tooling costs!



8900 Santa Monica Blvd., Los Angeles 46, California

Get to the POINT... in a hurry!



#### with

## PRATT & WHITNEY Electrolimit JIG BORERS

The point we'd like to make is that Pratt & Whitney Electrolimit Jig Borers incorporate an exclusive method of locating the table that is unbeatably fast and convenient... and accurate to .0001". Thanks to the P&W Precision Preloaded Ball Roll Quill, you'll be able to retain original accuracy and rigidity indefinitely without any adjustment or maintenance. And there'll never be any loss of accuracy from wear.

NOW . . . Pratt & Whitney Electrolimit Jig Borers can also be furnished with positioning control by NUMERICAL DATA.

COMPLETE LINE includes table sizes from 12"x24" to 36"x72".

Write for free copy of P&W Electrolimit Jig Borer Circular No. 587.

ALSO FURNISHED...a full line of Pratt & Whitney End Measure Jig Borers which also deliver "tenths" accuracy year after year.



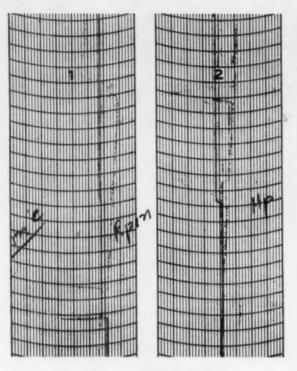


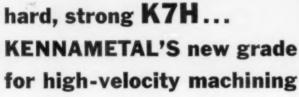
#### PRATT & WHITNEY COMPANY

INCORPORATED

16 Charter Oak Boulevard, West Hartford, Connecticut Representatipes in Principal Cities Throughout The Country

MACHINE TOOLS . GAGES . CUTTING TOOLS





In lab and shop tests, Kennametal\* Grade K7H has proved to be a real "work horse" for high-velocity machining.

It's a genuine carbide—the hardest ever offered by Kennametal (93.5 Rockwell A).

It's strong—two to three times the strength of non metallic cutting materials... strength to resist chipping and cratering... strength to trace and cut to a shoulder... strength to stand up to normal shop abuse without "babying."

It's versatile . . . has the stamina to cover the range of feeds and depths of cuts for modern high-velocity finishing of steel alloys and the new hard-to-cut materials. Grade K7H even takes casting "skin" and forging scale in stride on light cutting—another indication of its strength and stamina.

#### In the Lab-with tool post dynamometer:

Compared with other carbides at high velocity, Grade K7H showed these results: Test No. 1 (without coolant)

—K7H performance, cutting 29-32 Rockwell C steel, indicated 27 times longer life; Test No. 2 (with coolant) —K7H showed 28 to 1 better performance (also on 29-32 Rockwell C materials) than the control carbide grade; Test No. 3 (without coolant)—cutting 37-39 Rockwell C steel, Grade K7H showed considerably higher resistance to wear than other carbides.

#### In the Shop-production runs:

Compared with non metallics, and long-established carbides on high-velocity finish machining of SAE 5135 170-207 Bhn., Grade K7H averaged 1000 gears per cutting edge while other carbides produced only 350 pieces, and ceramics broke down at 400-450 per edge.

These tests show that Kennametal Grade K7H is truly the "work horse" for high-velocity machining as we know it today. Why not ask a Kennametal tool engineer to demonstrate Grade K7H in your operations. Or write for complete information. Address Kennametal Inc., Latrobe, Pennsylvania.

\*Registered trademark





KENNAMETAL ... Partners in Progress



## RIVETT

FURNISHES A

## Complete POWER PACKAGE!

Get <u>all</u> your air and hydraulic needs from one source!

Over 500 standard models in all sizes for immediate delivery!

#### AIR CYLINDERS - 168 Models





TIE ROD DESIGN

150 P.S.I. air; 250, 350, 300 P.S.I. oil. 8 mountings; 10 bore diameters; single or double end rod; internal or external thread; cushioning. J.I.C. Special covers. See Catalog 10.

#### KEEPER RING DESIGN

150 P.S.I. air; 300 P.S.I. oil. 7 mountings; 9 bore diameters; single or double end rod; internal or external thread; cushioning. Special covers. See Catalog 55.

#### AIR VALVES-47 Models



150 P.S.I. 3 and 4-way. Hand, foot, cam, solenoid, and pilot. ¼", ½", ½", ½" and 1". Pilot valves in side and foot mountings—palm, push-button, cam, foot, solenoid operation. See Catalog 303.

#### POWER UNITS-17 Models



1000 and 1500 P.S.I. Single pumps in six tank sizes. Capacities .4 to 40 G.P.M. Double pumps in four tank sizes with combined capacities 3.5 to 80 G.P.M.

#### CUSTOM-BUILT

Pressures to 5000 P.S.I. For unusual space, size, piping, valving, mounting, operation. See Catalog 400.

The Better You Know Hydraulics
The Better You Like



#### HYDRAULIC VALVES-200 Models



1500 and 3000 P.S.I. Stand-



1500 and 3000 P.S.I. Standard, spring-return, springcentered, ball detent. All piston designs. Hand, foot, cam, solenoid, solenoid pilot, oil pilot, air pilot. 14", 14", 2". See Catalog 204.

Panel valves conform to J.I.C. Greater flow; low pressure; shock resistant. Interchangeable sizes. See Catalog 261.

Pipe Mounted Direct Control Functional

#### HYDRAULIC CYLINDERS-108 Models



furnished. 7 mountings; 10 bore diameters; standard and 2:1 over-sizerod: single and double end tods, internal or external thread; cushioning. Special covers. See Catalog 106.

300 and 1500 P.S.I.: 3000 P.S.I.

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Member National Fluid Power Association



Reading: .0001" Sizes: 3/16" to 1.6"

This unique new precision measuring instrument will take measurements of blind holes. No masters or setting rings needed — measures directly — by .0001".

Automatically aligns in holes, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes. Extensions facilitate accurate measurements of holes up to 6 feet in depth. Hardened contact points exert—will not damage even fragile work.

Exceptionally easy to read, deep clean-cut graduations laid out on a large diameter thimble. Dull chrome plated finish. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments: VER-NIER CAUPERS—MICROMETERS—DIAL INDICATORS

AINA

ALINA CORPORATION
401 Broadway, New York 13, N. Y.

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FREE — New Bulletin T-1 shows, describes VAILL tube end forming machine VERSATILITY for . . .

Beading ● Flaring ● Flanging ● Sinking

Expanding ● Grooving ● Threading ● Reducing

Double Lap Flaring ● Double Lap Flanging

on Tubing up to 6"Diam.



THE VAILL ENGINEERING CO.

131 E. MAIN STREET WATERBURY 20, CONN.

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## Take LESS TIME MAKING SET-UPS!



In making set-ups for tapping and reaming, you'll find it to your advantage to use Ziegler Floating Tool Holders instead of ordinary tool holders because they greatly shorten set-up time.

For example, with Ziegler Holders, it makes no difference if the work is out of alignment as much as 1/32" on the radius (1/16" on the diameter). The machine will still turn out perfect holes because the Ziegler Holder is so designed as to correct the inaccuracy in set-up.

By reducing set-up time, the Ziegler naturally also reduces labor costs—something worth keeping in mind.

**Prompt Delivery** 

W. M. ZIEGLER TOOL COMPANY

13574 AUBURN

DETROIT 23, MICH.



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### MADISON-FAESSLER TOOL CO.

now

## LINKED TOGETHER

to produce the finest

INNER DIAMETERS







PRECISION DRILLING









The Faessler Tool Co. of Moberly,

Missouri joins the Madison group to add another link in the Madison Inner Diameter chain. Faessler's unique Roller-Burnishing Tool with its capability for producing a mirror-like, burnished finish in any internal cylindrical surface, complements the art of hole making as practiced by Madison. This combination of talents expands the inner diameter scope of your Madison Man through a range of boring, reaming, precision drilling, trepanning, roller-burnishing and gaging, in a variety of sizes and depths.

Your Madison Man continues to grow for you!









'inner diameters are our business'



## Heads...You Win!

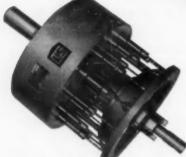
U. S. DRILL HEADS, THAT IS!

Regardless of the size of your shop, if you have high production jobs, you'll find an extraordinary reduction in tooling and manufacturing costs when you use U. S. Drill Heads.

The heads shown here, moderate in cost, are for use with automatic chucking machines and turret lathes, for drilling or tapping operations. They provide, in most cases, that a part can be completely finished in one handling.



For semi-automatic setup



For semi-automatic setup.



Manufacturers of all types of adjustable, fixed center and individual lead screw tapping heads.



DRILL HEAD

THE UNITED STATES DRILL HEAD COMPANY

BURNS STREET . CINCINNATI 4. OHIO

another Bath Tap job well done..

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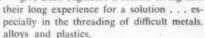
MERCURY OUTBOARDS

The Kiekhaefer Corporation . . . nationally known for their pace-setting line of Mercury outboard motors . . . used Bath engineering service in the selection of the right tap for the job . . . threading aluminum.

No extra cost for expert advice . . . no need for a special expensive tap, since Bath engineers recommended a stock tap with the proper features to provide the clean, accurate threads required in the precision-built Mercury gear case.

Perhaps this service can save time and money for you, too! In many instances, a simple change in stock tap selection will improve your quality of workmanship and increase production.

If you have a tapping problem — give Bath engineers a chance to dig into





Threading aluminum lower unit gear case of a Mercury Mark 25 outboard motor with a 34"-16 NF Bath Tap.



JOHN B

ATH & CO., Inc. 28 Grafton St., Worcester, Mass.

CYLINDRICAL AND THREAD GAGES - GROUND THREAD TAPS - INTERNAL MICROMETERS

#### WALTER W. FIELD & SON INC. 39 HAYWARD STREET, CAMBRIDGE 42, MASS

This door panel was made entirely on a PULLMAX



Pullmax machines have the versatility to do all of the metalworking jobs in your Model Shop, Engineering or Maintenance Departments.

One machine does straight shearing, inside or outside circle cutting, design cutting, inside square cutting, beading, joggling, slot cutting, louver cutting, dishing, edge bending and flanging. Seven sizes of machines cut up to the company of the demonstration.



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CUTTING

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AMERICAN PULLMAX

North Sheffield Avenue . Chicago 41, Illinois

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## ALEXANDER DIE-SINKERS



for 2 or 3 dimensional work

Latest model, No. 3A for molds and dies up to 1000 lbs. Ratios from 1.5:1 to 10:1, 14 spindle speeds from 475 to 9500 rpm, cutters up to 3/6" dia. Two smaller sizes, 1A and 2A.

Get a close look at Alexander engravers, die-sinkers, and cutter grinders—optical dividing head, centering and cutter grinder microscopes, cylinder roller attachments and other acces-sories. Write for catalog D on these quality, British machines

ARTHUR DEAKIN & SON

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Hold any shape stock aligned with miller, shaper, drill press or tapper. Famous for key-way setups. Value proven in large and small shops. 4 sizes

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PULLMAX METALWORKING IDEA

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USE READER SERVICE CARD: INDICATE A-5-324-4

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#### AIR EXHAUST MUFFLERS



# Stop Air Blast and Noise!

Want to get rid of annoying air blast, excessive noise? Just install inexpensive MODERNAIR Air Exhaust Mufflers in the exhaust ports of your air valves. Simple, rugged, non-corrosive nothing to lubricate or maintain. Made for 14" and 36" NPT port sizes: only 4-3/16" long, 1" diameter. Price, \$2.75 each. See your MODERNAIR distributor or write us today.

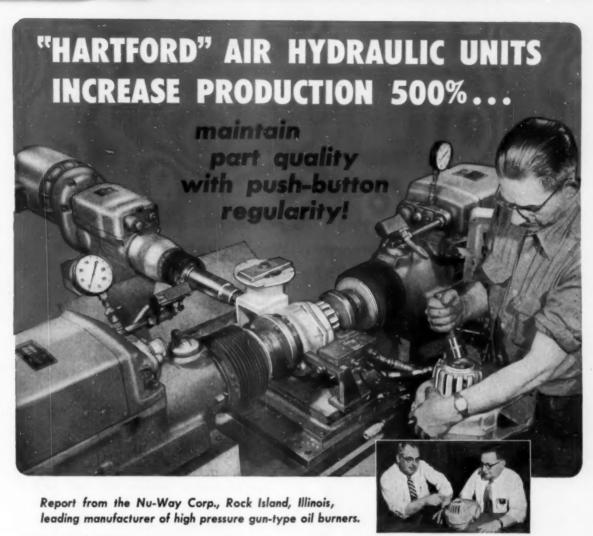
CACALLY CORPORATION

400 PREDA ST., SAN LEANDRO, CALIF.

Member National Fluid Power Association

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The Tool Engineer



Three Hartford units in a special production machine solve a critical bore alignment problem for Nu-Way. Two opposed units rough and finish bore and finish face bosses in sand cast aluminum blower housings. Through an electrically controlled sequence, rate of feed and speed is automatically regulated for roughing and finishing operations. Simultaneously a third unit at the rear is tapping a 1½" hole 90° from the two in-line bores. By roughing and finishing in one setting, perfect alignment between motor and pump bores and facings in relation to the pedestal of the burner is maintained. By changing the holding fixture, three different models of burner can be machined. On Nu-Way's model XL-2000 alone production has jumped from 14 to 80 pieces per hour!

Benefit from Nu-Way's experience. Let Hartford Drill Units give you better products at lower cost

through better methods.



ROBERT TURNER, Prod. Mgr., (left inset) says, "In addition to keeping rejects to a minimum, inspection is simpler and a rigid standard of quality control has been maintained."

ELMER DOYLE, V.P. in charge of production, (right inset) says, "Hartford Drill Units are doing everything we can demand in an auto-cycle operation."

GLEN LASCHANSKY, operator of the machine says, "After I set up the first casting, I never have to worry about the three drill units or the machine's operation. It will run at close tolerance as long as I press the button."

MACHINE TOOL D THE HARTFORD S 280 Homesteed Avenue	PECIAL MACHINES	ey co.	A-507-5
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# A New Concept of Vertical Measurement

# The Webber Micro-Accurate OPTICAL HEIGHT GAGE

Employing TWO proven Principles of Precision Measurement...Webber Gage Blocks and the famed Leitz Measuring Microscope

Now, for the first time you can make vertical measurements up to  $49^{\prime\prime}$  and be absolutely certain of their accuracy. No longer is special or expensive laboratory equipment needed. The workman himself can do his own inspecting, saving expense, speeding production and attaining an accuracy  $\pm$  .000005" per inch of length up to the full 49" of height.

#### A Working Tool

The new Webber Micro-Accurate Optical Height Gage is not a laboratory instrument, although it has laboratory accuracy. Any workman having ordinary skill, can use it right on the job to transfer measurements from a surface plate, with accuracies hitherto unknown. The time-consuming task of wringing gage blocks together is eliminated. The new Optical Height Gage is simple to use, will speed production, vastly improve accuracy . . . save money.

In 25", 37" and 49" models.

Next to your gage blocks, the new Webber Optical Height Gage will be the most useful tool in your shop.

GAGE COMPANY

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LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

You Get These
Exclusive Safety
and Handling Features

with all

# SUPERIOR DIE SETS

Large Sets No Longer Need Be Blocked . . . Small Sets Can Be Lifted Without Sliding.

Three features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment. Write for FREE 24 page Catalog on Superior Die Sets and Supplies.

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   Phone 2-3453
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   FR 1-1321
- Winter Park, Fla. Phone 5-0464
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   SHerwood 7-2701



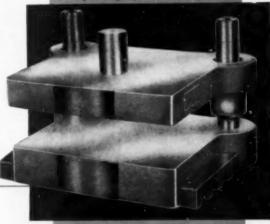
SAFETY FLANGE

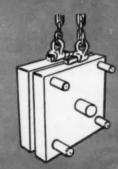
protects fingers by providing reemy



OCK-JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place form ing an integral part of the die set





E-Z LIFT SLING CHAIN

is aspecially designed to III the floorpes of the die sets. Male jave etteched to the cling fit quickly Into place for immediate lifting. There is no need for screw clemps, eye belte, or lifting logs.



STEEL PRODUCTS CORP.
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24 Page

FREE

Catalog

# Multiform BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses







many forms that can be produced ficiently on the Multiform Bend using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes omplete with dies, mandre's and wrenches—punching and blanking dies extra.

> Will punch holes up to 1" and form material up to 34" thick by 4" wide. We also build smaller hand or air operated models for forming up to \%"x1\%" material.

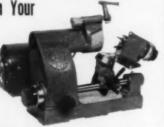
These machines are solving new forming problems in many plants and could be the answer to

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903 North Pitcher St. Kalamazoo, Michigan Pitcher St.
Michigan
USE READER SERVICE CARD; INDICATE A-5-328-1

Precision Sharpen Your Die-Sinking Cutters on an ALEXANDER





Also 2- and 3-dimensional pantograph engraving machines Write for catalog D on these quality, British machines

J. ARTHUR DEAKIN & SON

150-28 HILLSIDE AVE.

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# **Expanding Mandrels**



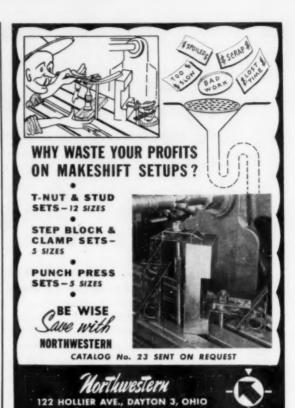
Accuracy 001" - No Distortion No Slipping - Everlasting



ABERDEEN, SOUTH DAKOTA

If it's made by Lee it's a "Knock-Out"

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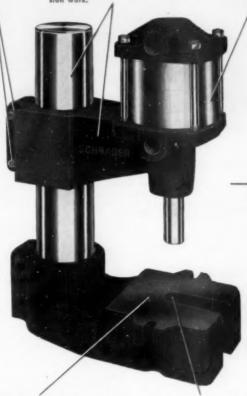
USE READER SERVICE CARD: INDICATE A-5-328-4

TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 201.

TWO-BOLT CLAMPING adjusts easily, positively from 6" to 7" in height, and swing arc 2" each side of center.

HEAVY-DUTY CYLINDER with extra heavy wall, the rods and piston construction for langer life.

RIGID STEEL COLUMN and rugged cylinder bracket are accurately machined for precision work.



HEAVY, RUGGED BASE forms sturdy foundation for large machined-surface table area.

SPECIAL RECESS IN TABLE provides for punch-through operations.

# NEW SCHRADER AIR PRESS

# It's compact and power packed!

It stamps, coins, broaches, rivets, stakes, presses, shapes, bends, assembles—many other uses!

# Modern "muscles" of compressed air never tire . . . get more work done at less cost!

This modern Air Press has unlimited possibilities for speed, power, positive performance. Available as single acting for impact jobs; double acting for squeeze and power withdrawals. It requires minimum space, next to no maintenance, is extremely versatile in adapting to operating controls. Can't be beat for low cost practicality.

Important feature: Control and speed of the extra heavy cylinder and ram can be varied as necessary, by using standard Schrader Air Control Accessories that adjust in seconds.

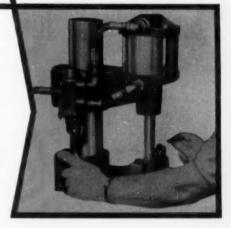
Write for Catalog data describing Air Press fully—including variety of controls and accessories. Your Schrader supplier has the Air Press you need!

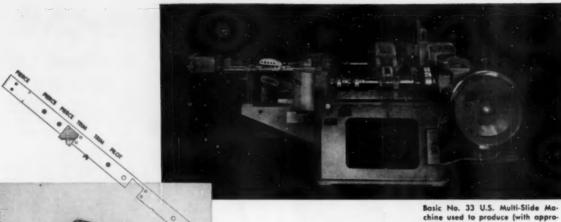
#### A. SCHRADER'S SON

Division of Scovill Manufacturing Company, Incorporated 470 Vanderbilt Avenue, Brooklyn 38, N. Y.



LEADERS IN AIR CONTROL SINCE 1844





Basic No. 33 U.S. Multi-Slide Machine used to produce (with appropriate tooling) the automotive component illustrated.

The drawing at the left shows the sequence of operations performed in the U.S. Multi-Slide to produce an automotive component complete in the U.S. Multi-Slide.

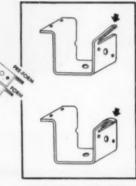
View of the completed part.

# MULTIPLE OPERATIONS ON U. S. MULTI-SLIDES® MULTIPLY PROFITS

Each secondary operation eliminated means reduced piece part costs. You, like all other manufacturers, are striving to attain this end result. In the production of formed metal stampings from coil stock, the U.S. Multi-Slide may be the answer.

U.S. Multi-Slides are designed primarily for the automatic production of precision formed stampings from coil stock. Many different types of stampings ordinarily requiring secondary handlings can be produced complete on the Multi-Slide.

The part illustrated on these pages is a component for an automotive manufacturer and is produced complete without secondary handlings. The sequence of operations is pierce, trim, coin, extrude, cut off and form (2 levels). This automotive component is just one of many different types of stampings which can be produced complete on the U.S. Multi-Slide.



A two level forming position is used to produce the automotive component. The top view shows the pre-form obtained in the upper level and the lower view shows the finished form obtained in the second or lower level ferming position.

If stampings are included in your production program, ask for a copy of Bulletin 15-T illustrating and describing the four sizes of U. S. Multi-Slides we now build.

# U.S. TOOL COMPANY, I

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers
U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

# stock answers to your gaging problems .

SNAP GAGES Adjustable, for O.D., I shoulders, grooves. to 6" range with



GROOVE LOCATION GAGE Checks from face to top or bottom of groove, and deep holes or slots.



GROOVE GAGES For "0" ring and snap ring grooves, 1/4" bore to 5". Adoptable for special applications.

BORE GAGES For bores 1/6" to 12" dia. Two point setting with equalizers.



DEEP HOLE GAGES For bores up to 20 feet in length. Prices on application

COMPARASCOPE A precision instrument for checking surface finishes. West Coast Distributor for Hemco Gages

TEST INDICATORS Exclusive features with .001 or .0001 accuracy.



THREAD AND GEAR WIRES Finest quality measuring wires



LIGHT WAVE EQUIPMENT lide choice of capacities, ith high level of visibility.



GAGE BLOCKS Solid square in "A" accuracy. Rectangular in "A" or "B" Round micro-



The Reliant " Product of the Month"

... the right gage for

Accurate

Compact

· Rugged



SPECIFICATIONS: .0001 indicator with revolution counter. .125 to .250 diameter range with eight interchangeable extensions.

Distributors are invited to request information on available opportunities.

\* There are many more, and some "special" ones, too.



SURFACE PLATES Black granite, honed surface to 50 mil-lionths accuracy.

projecting

PLUG AND RING GAGES Finest precision plated gages.

West Coast Distributor for Hemco Gages



HEIGHT GAGES 12", 18", 24" and 36" models.

Extended verniers

carbide scribers, zero adjustment to surface.

ELECTRIC COMPARATORS English or metric graduations. 4 gaging ranges.

> TEST SETS Magnetic base or T-slot base models.

INDICATOR TESTER 2 stage. Takes cor-rection curve and measuring pressure.

> MASTER SET RINGS al toleranced with a low

BENCH CENTERS Inspect lengths. heights and dia-meters. Reversible centers, Accessor



VERNIER CALIPERS Hardened tool steel with extended verniers, 6", 12", 20", 24" and 36" models.

BENCH COMPARATORS Several types available 1 or 2 indicators.

TOOLING BALLS 4 shank lengths. Accessories for use with sight levels

transits, auto-collimators.

Reliant

RELIANT GAGE & SUPPLY CO. SOUTH GATE, CALIFORNIA



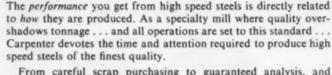






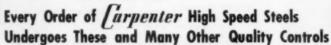
# How Men and Controls Protect Industry's Confidence in *[arpenter* High Speed Steels







From careful scrap purchasing to guaranteed analysis, and painstaking time and temperature checks during melting . . . through rigid controls of bar reduction in rolling, and many other quality tests at all steps . . . these are the "indispensables" that have enabled Carpenter to produce the finest High Speed Steels for 60 years. And most important is the personal attention Carpenter men give to every order. The experience, pride and skill these craftsmen put into the production of every bar make Carpenter High Speed Steels your most dependable investment. Your best proof is to place your next order with Carpenter . . . and see what a difference there can be in High Speed Steels. THE CARPENTER STEEL COMPANY, 154 W. Bern St., Reading, Penna.





- Small, electric furnace melting units are used to control quality and uniformity to the highest degree.
- Every heat of steel is constantly checked for chemistry, temperature and melting time.
- Preheat and high heat furnaces are guarded for accurate time and temperature to prepare the steel for rolling.
- Percentage of reduction in cogging billets for rolling or forging of bars is skillfully controlled to assure freedom from internal stresses.
- Discs cut from each bar are acid etched, examined, hardened and fractured to certify internal cleanness, soundness, freedom from excessive segregation. And the hot acid etch is backed by Ultrasonic Testing.
- Slugs are cut from each lot of billets and machined in "step-down" fashion to guard against internal seams, shadow lines, etc.
- Extensive laboratory tests are made for proper hardness, micro-structure, grain size.
- Turning tests are run regularly to check cutting efficiency.
- For best results, put your confidence in . . .









high speed steels





# Here's GREATER POWER for you ... in a MORE COMPACT DESIGN

#### FEATURES YOU WILL LIKE:

- compact design.
- Resistance to corrosion throughout.
- · Positive sealing with minimum friction loss.
- · Materials selected for strength, durability and long cylinder life.
- · Interchangeable heads and mountings.
- Conformation to J.I.C. Standards.
- o Greater power from a more o Automatic compensation for rod packing wear.
  - . Built-in piston rod scraper to prevent dirt and abrasives from scoring rod or damaging packings.
  - · Adjustable cushions of unique design.
  - · Wide choice of operating pressures; Air to 250 psi; hydraulic to 750 psi.

# **CYLINDERS**

 You'll find some unique and very interesting operating features in these new Hanna 7750 Series Fluid Power Cylinders . . . features that will help you solve many of your cylinder application problems more easily and more simply. The new Hanna 1750 Series comes in a range of capacities, sizes and mounting styles-for air operation up to 250 psi and hydraulic operation up to 750 psi.

For details, ask your Hanna Representative (see your classified telephone directory), or write today for a copy of the new 7750 Fluid Power Cylinder Catalog. No obligation.

Hanna Engineering Works

1768 Elston Avenue, Chicago 22, Illinois

NEW CATALOG

Write for Catalog 750A-it gives

# 24th ASTE ANNUAL CONVENTION TECHNICAL PAPERS AVAILABLE NOW!

Mail Your Order Today

The following technical papers delivered at the 24th Annual Convention of the American Society of Tool Engineers, in Chicago, March, 1956, are ready for immediate distribution.

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T1	Ceramic Tooling Brought Up to Date	T31	Automation—Its Effect on Jigs and Fixtures
T2	The Drawing of Titanium	T32	A Survey of Surface Finish Inspection Tech-
T3	Machining with Silent Sound		niques
<b>T4</b>	Recent Advances in Grinding Wheels	T33	Surface Finish and the Production Engineer
<b>T</b> 5	Precision Production Grinding Machines	T34	Automation for the Big Production Shop
T6	Electrical Discharge Grinding of Tools		Automated Electronics
<b>♦ T8</b>	Crystallography and Grinding Hardness of the	-	Fluid Power for Machine Tool Drives
A TEN	Diamond Crystal		
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# CARBURIZING

This is the operation for which the Leland salt bath was originally purchased. Work is heated at 1650° for 30 minutes. cil quenched and washed. A consistent, scale-free 0.005" case with surface hardness of R<sub>1.5</sub>x 75/80 is obtained.





## SIMULTANEOUS BRAZING AND CARBURIZING

2 Simultaneous brass brazing and carburizing cut cost from \$78 to \$13.11 per 1.000 parts, eliminated 3 handling operations, saved time. Average strength of brazed joints is 40.000 PSL Case depth is 0.005"—0.007" with R<sub>1.55</sub> 80/85 surface hardness.



#### BRAZING

Ajax Salt Bath brass brazing of this assembly reduced costs from \$14.20 to \$9.10 per thousand—without considering the reduction in rejects from 25% to less than 1% and elimination of 3 additional treatments previously needed with copper brazing.





### HARDENING

A SAE-1050 and 1065 cold rolled parts are hardened in the same Ajax bath used for the 3 other operations. Hardened parts will bend 45° before fracturing. The "pick-up" of a superficially carburized case is not objectionable.



...that saved \$37,000 the first 8 months!

Write for details outlining the G. H. Leland Inc., multi-use operation of its Ajax salt bath.

Let Ajax engineers demonstrate similar heat treating savings. You get actual proof on your own work samples in the Ajax Metallurgical Service Laboratories. No cost or obligation.

During its first 8 months on the job, this Ajax Electric Salt Bath Furnace saved \$37,000 in the plant of G. H. Leland, Inc., Dayton, Ohio. This saving was figured after deducting all operating costs and 20% annual equipment depreciation!

Or, to put it another way, the amazing versatility of the Ajax furnace installation enabled it to pay for

itself in just a few months of usel
Not only does the Salt Bath handle

all four heat treating operations described and illustrated above... but the Leland model shop uses it for odd jobs as well.

Work is scale free. Distortion is no longer a problem . . . and the firm's entire parts processing has been effectively streamlined.



970 Frankford Ave. Philadelphia 23, Pa.

electric SALT BATH furnaces

Associated Companies: Ajax Electric Furnace Corp. • Ajax Electrothermic Corp. • Ajax Engineering Corp.

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May 1956 Issue

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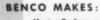
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This differential carrier assembly requires the boring of accurate holes at right angles to one another. Bore diameters are held as close as .0005". Shoulders must be square with bores. Bearing bores must be square with pinion bores.

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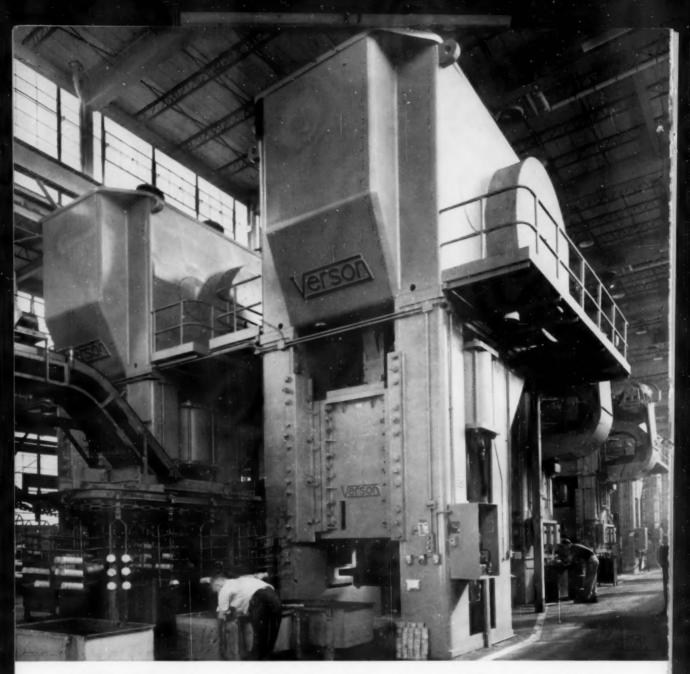
SIMULTANEOUS MACHINING of four holes assures a 90° relationship between bearing bores and pinion bores.

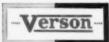
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